

New Records Expected at This Year's Indianapolis Race

By LOUIS SCHWITZER

AN improved track, new cars and engines, and the "bugs" worked out of cars which were new under the international formula adopted by the AAA last year, appear to be a firm foundation on which to base predictions that this year's Indianapolis race classic will end with many records broken both in the race itself and in the qualification trials.* Keener competition is also expected. Race critics were disappointed over last year's one-sided victory when Floyd Roberts crossed the finish line with comparative ease, three laps ahead of his closest rival, Wilbur Shaw, who was in turn a full lap ahead of Chet Miller who finished in third place.

Improvements made on the track itself will help in the establishment of new speed records. The manage-

ment of the Indianapolis Speedway has been carrying on an improvement campaign for about five years, and the track has been developed to such a point that today speeds are permissible which were not considered possible on the track a few years ago. The guard abutment on the turns is believed to be of such design that no car can get through or over it, while the provision of large escape areas together with the removal of the former confining inside concrete wall also contributes to still higher speeds. The surface of the track has been so improved that power transmission through the tires is much more efficient, resulting in better acceleration and other control factors.

As to features of the cars completed or under construction as this is written there appears to be very little new in the way of clutches or transmissions, although there is at least one new transmission design. Brake designs show but little improvement, probably due to the fact that brakes are not used to any great extent in American racing. Most of the cars show no changes in suspension designs, although there are exceptions to this noted later. So far as can be told at this time there is nothing new in steering gear or linkage.

There appears to be a rather definite trend in engine design toward the use of more cylinders than have been popular in recent years. Most of the new engines of 1938 and 1939 have had six cylinders. This would seem to be a sound and healthy trend. The two very fast Thorne cars last year were equipped with highly supercharged six-cylinder engines of a more modern design than any engines previously seen at Indianapolis. These engines and cars will be back this year with their performance still further improved.

The use of superchargers for racing would seem to be an essential if maximum possible performance is desired. The difference between the possible output of a highly supercharged engine and a very finely developed engine without supercharging is so great that the supercharged engine can take a 50 per cent displacement handicap and still be definitely the better

*International formula adopted by the AAA allowed only cars of 183 cu. in. displacement to use superchargers, and those without superchargers to go as high as 275 cu. in.



Louis Schwitzer has been chairman of the "500" technical committee for 10 years

unit, so far as available power is concerned. A high degree of supercharging for racing is not possible with petroleum fuels because of the necessity of obtaining cooling from the fuel itself. The high alcohol fuels used for highly supercharged engines have in general three times the cooling effect of petroleum fuels. Unfortunately, most of the engine developments which have produced such fine results at the Indianapolis Speedway and elsewhere cannot be accomplished without adding to production costs rather substantially. The trend in American products, at least, is to develop designs of satisfactory performance at the lowest possible cost. For this reason, and probably for this reason alone, it seems likely that the developments of the race track are unlikely to have any immediate practical application for the owner-driven passenger car.

The following brief descriptions of certain of the cars which seem to have features of special interest are all that could possibly be checked at the time this article was written:

The car prepared by Joe Lencki follows orthodox Indianapolis design, except as regards the engine. It has a 274 cu. in. six-cylinder engine having $3\frac{3}{4}$ in. bore and 4 in. stroke. The mechanical design of the engine was prepared by Mr. Goosen, whereas the specifications for the elements influencing breathing capacity and combustion chamber form were done by Ed Winfield. The engine was built by the Offenhauser Engineering Co.

This car is designed to use Milan disk brakes, and the necessary parts have been made. At this writing there is some question as to whether or not the equipment will be used on the front wheels, but it seems certain it will be used on the rear.

It is a very fine looking job and should show a decidedly improved performance over the four-cylinder engines of approximately the same displacement.

The Maserati, of Boyle Racing Headquarters, is a new straight-eight of 183 cu. in. displacement equipped with two Roots type superchargers delivering to a common manifold. This car has independent suspension at the front with torsion bars and an orthodox rear axle with semi-elliptic springs. There are a

number of interesting features to the car, probably the one of greatest interest being the combination oil tank and cross member cast in a deep cruciform of light alloy with a suitable tunnel for the propeller shaft. This structure provides great rigidity at the point of reaction for the torsion bar springs for the front suspension.

Of outstanding interest is the fact that the front brakes are substantially larger than the rear brakes, and all are of extremely light construction, as the drums are cast of magnesium alloy with a hard friction surface shrunk in. The weight of the wheels is only 50 per cent of the weight of similar size wheels of American manufacture. The wheels are of the Rudge type with steel hubs, spokes and rolled magnesium rims fabricated in Germany. The engine will run on a high methyl alcohol fuel and will probably have an output of between 400 and 450 hp. at somewhere between 7500 and 8000 r.p.m.

The Sampson entry is using the engine developed by Frank Lockhart for his straight-away record trial ten years ago, with but few alterations. The large intercoolers used between the supercharger and the engine have been eliminated and new type valve springs have been provided. It is understood that the engine is otherwise without change. The engine is 183 cu. in. total displacement for the sixteen cylinders.

The chassis is interesting due to its very small frontal area. Both front and rear axles are of the deDion type. The rear suspension is by torsion bar, whereas the front suspension is the typical Miller front-wheel-drive type with four quarter-elliptic springs. The car is rear wheel drive. It will be driven by Bob Swanson.

The design of this car is developed somewhat similarly to that of some of the European cars that have been so successful in recent years, in that the crankshaft is so low that the propeller shaft and main shaft of the transmission are below the counter-shaft and bevel gears, and the drive is indirect at all times. While there are some disadvantages to this construction, there are also great advantages, and it would seem to be worthwhile to make every effort possible to decrease the frontal area of the automobile.

(Turn to page 609)

The Brass-Hat Rack



"I wonder if our 1940 public is quite ready for this?"

BUSINESS IN BRIEF

*Our own view of automotive production and sales;
authoritative interpretation of general conditions*

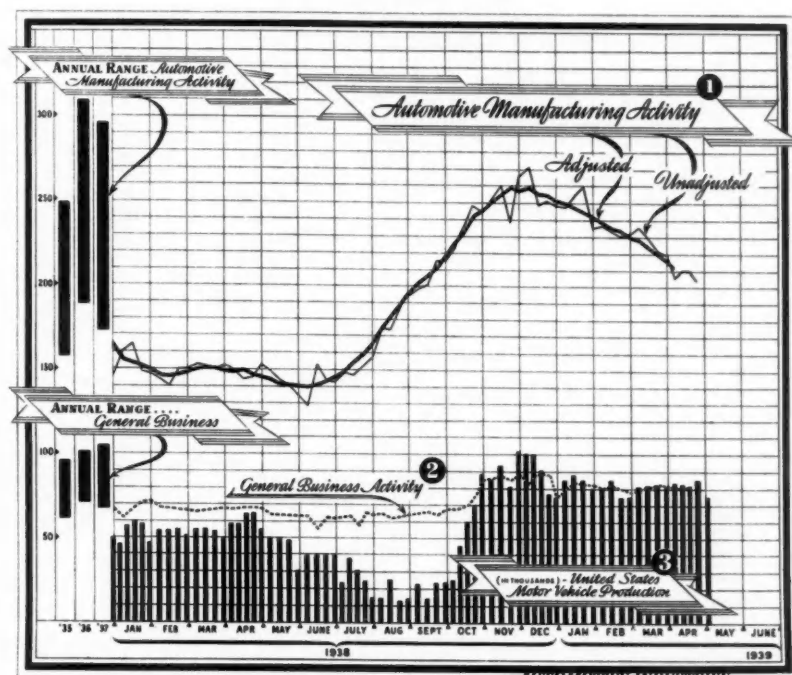
PRODUCTION schedules during the first two weeks of the month showed a tendency to taper off although not as greatly as originally anticipated. With prospects that sales would continue to run strong throughout May, car and truck production for the balance of the month was expected to continue at a healthy pace although at a gradually declining rate.

April proved to be a better than expected sales month for the industry as a whole and deliveries ran about 50 per cent ahead of the same month a year ago. It was indicated in some quarters that sales had not yet reached their spring peak during April and that the first two weeks in May probably would represent the high point of the current sales season.

Production of cars and trucks during the first week in May showed a slight drop from the final week in April with output estimated³ at approximately 76,000 units. During the second week production was expected to be several thousand units less although the first half of the month was expected to account for more than 150,000 units. The monthly total, based on preliminary estimates, may exceed the 300,000 mark.

AUTOMOTIVE MANUFACTURING ACTIVITY for the week ended April 29, as indicated by the unadjusted index curve¹ on the accompanying chart, sought the new low point of 204, a drop of six points. The adjusted curve¹ continued downward and reached 212 for the week ended April 8, four points below the previous mark.

¹ 1923 average = 100; ² Prepared by Administrative and Research Corp., New York. 1926 = 100; ³ Estimated by J. A. Laansma, Detroit News Editor, AUTOMOTIVE INDUSTRIES. ⁴ Summarized for AUTOMOTIVE INDUSTRIES by the Guaranty Trust Co. of New York.



Weekly indexes of automotive and general business charted

April Car Sales Top 1938 Period

power and light industry in the same week, reversing the downward trend of the preceding fortnight, rose more than seasonally and increased the margin above last year's corresponding production to 12.7 per cent as compared with 10.9 per cent in the preceding week.

Business failures during the week ended April 20, as reported by Dun & Bradstreet, numbered 268, as compared with 265 in the preceding week and 241 a year ago.

Professor Fisher's index of wholesale commodity prices, reversing the recent trend, declined last week to 80.1, as against 80.3 for the preceding week, the year's high to date, and the low point of 79.5 in the second week of February.

Reserves of member banks of the Federal Reserve system increased \$159,970,000 during the week ended April 26. Estimated excess reserves again rose \$120,000,000, to a new peak of \$4,120,000,000.

The General Motors-Cornell world price index of 40 basic commodities for the week ended April 22 was 60.5, compared with the previous week's figure of 60.4. The United States index in gold remained the same, at 62.3.

GENERAL BUSINESS ACTIVITY⁴ continued steady throughout the week ended April 29. The index of the *Journal of Commerce* for the week ended April 22 registered a further fractional advance to 80.4, as against 80.0 for the preceding week and 69.3 a year ago.

Railway freight loadings in the week ended April 22 extended the gains reported for the preceding week and were 6.7 per cent above the loadings a year ago.

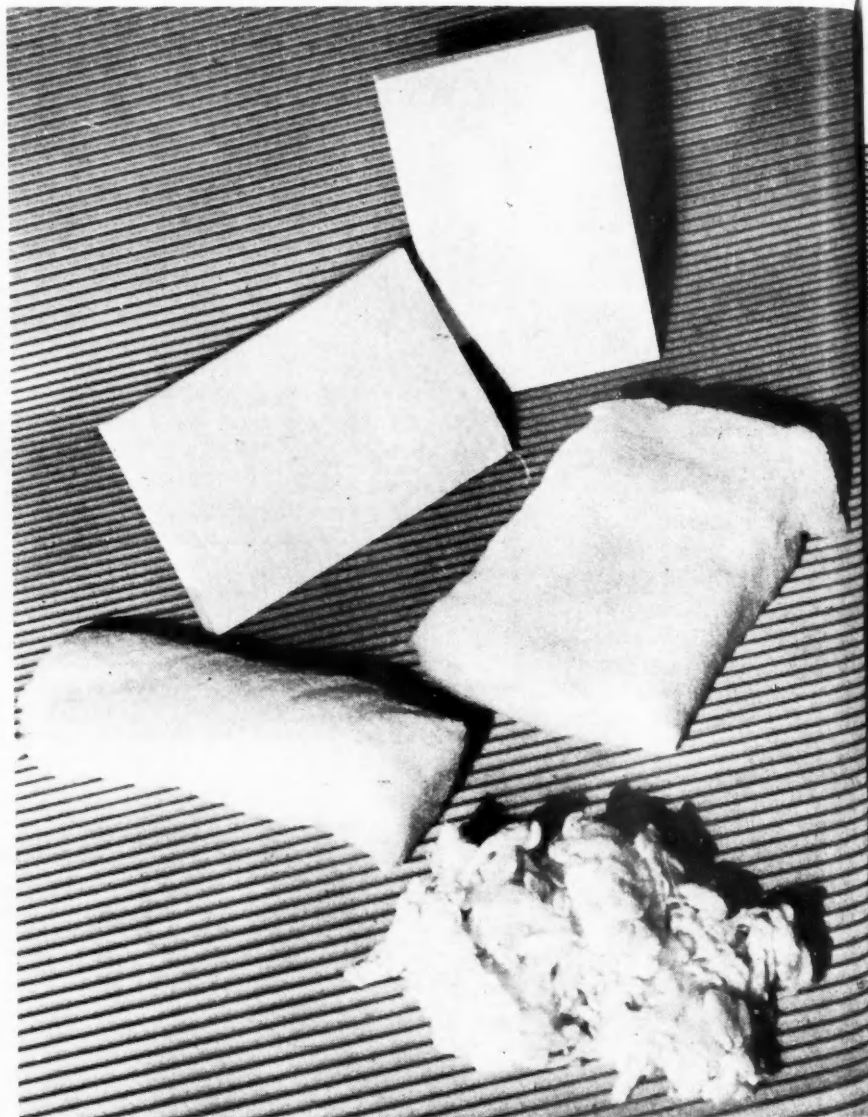
The output of electricity by the

It's Control All

W OOL FELT used in modern motor vehicles is essentially the same material that was known to man long before the dawn of recorded history, but it is a vastly superior product compared with the felt made by the Asiatic nomads to whom its invention is generally attributed. The technological advances that have brought stainless steel and plastics into commercial utilization on a large scale have likewise contributed to constant improvements in felt so that this product as it exists now is appreciably better than it was only five years ago.

Foremost among the developments contributing to the excellence of present-day wool felts is the increasing control over the quality of the raw material. Some years ago the felt producers used, proportionately, a much greater quantity of new cloth clippings—by-product of the manufacture of clothing from worsteds and woolens. The purposeful fickleness of the Parisian style setters resulted in widely varying types of raw stock from this source, making it very difficult to predict the final properties of the felt. Therefore, the top-notch producers of felt have been leaning more and more toward the minimization of the use of clippings from the clothing houses.

Today, clippings are still used but great care is taken in their selection. As a result of these efforts to control the quality of the so-called "waste" materials, the producers of felt have established uniformity in their final product to a degree that was hitherto commercially impractical. Pressure of the automobile manufacturers for increasing rigidity in specifications of felt components of motor vehicles has been a potent



Stages in the manufacture of wool felt are shown above with a sample of raw stock at the lower right; roving (lower left); batt or carded stock, middle right; hardened stock, top left; and a piece of finished felt at top.

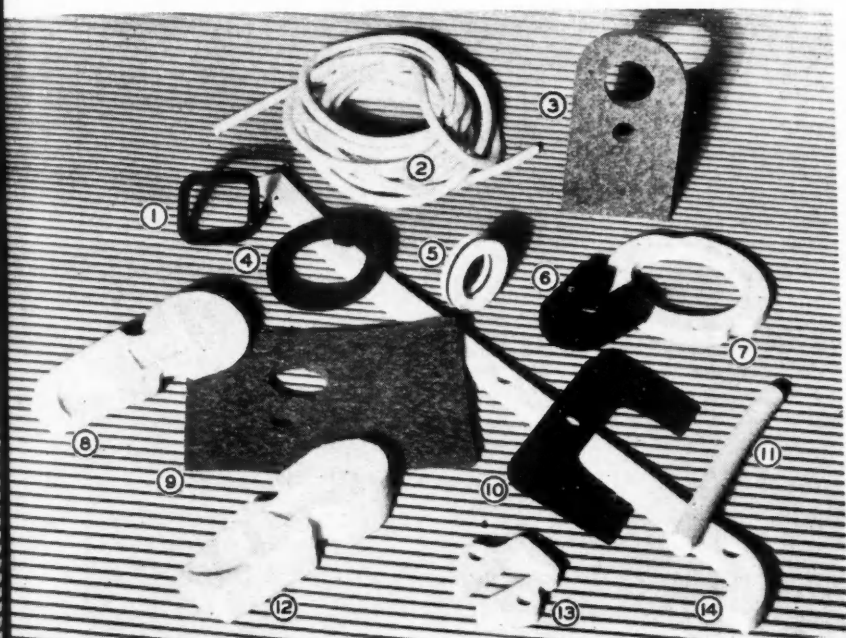
factor in the trend toward precision control in the manufacture of felt.

Definite advances have been made in the sorting and grading of wool. This infers, quite rightly, that the increasing rigidity of specifications previously mentioned has been carried back to the very source of supply. Present practice calls for scouring and chemical controls which have only been commercially available for a few years. As a result the wools used are cleaner and much stronger, whereas wool processed by the older methods of scouring and cleaning would be somewhat burned and tendered. So sure-fire are the methods currently used that one plant superintendent remarked to the author that "I haven't seen

Automotive
MATERIALS
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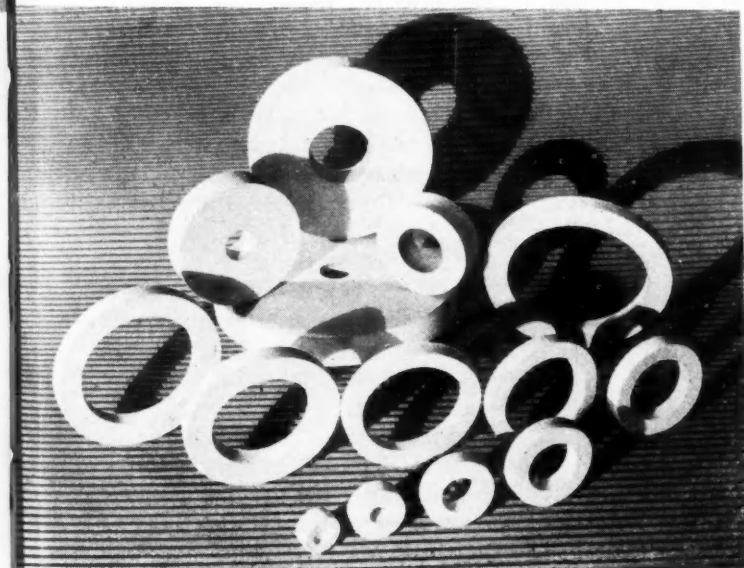
Along the Line

In the modern manner of making precision FELT components which will meet the stiff specifications set by the automobile manufacturers



Here is a small but representative group of felt parts used today in motor vehicles and aircraft: 1. Crankcase ventilator conduit outlet gasket, 2. All wool wicking, 9/32 in. diam., 3. Steering column insulator, 4. Rear axle pinion shaft oil seal, 5. Neoprene grease seal, 6. Clutch and brake pedal seal, 7. Grease retainer gasket, 8. (and 12.) Left and right hand rocker support cover oiler (aircraft), 9. Steering column floor pad, 10. Floor board side anti-squeak, 11. Oil wick (aircraft), 13. Pneumatic brake dust seal, and 14. Anti-squeak strip.

(Below) An array of wool felt oil seals and Duco rubbing and polishing discs.



a lot of tender wool in seven or eight years."

Wire clothing on the carding machines is made with much more precision than previously. The wires are finer and stronger, and special wires are made for special work. Advanced metallurgy, of course, has been a major aid in this respect. Hardeners have been built much larger, wider and sturdier; more attention has been paid lately to the type of platen cloths (canvas) used on these machines to produce various surface effects. Increased productivity of the hardeners has reduced costs without impairing quality. The linings of fulling mills have been improved with stainless steel which provides a smoother, longer-lasting surface than wood inasmuch as it is virtually impervious to corrosion, thus preventing "roughing" of the felt. Wood, which was originally used, caused the felt to drag in the fulling machine instead of permitting it to slip freely. Bearings at the crank-

Definitions of Terms

FELT—A fabric which is neither woven nor knitted, but built up by the interlocking of wool fibers by mechanical work, chemical action, moisture and heat.

FELTING—The ability of wool fibers to interlock with each other or with other fibers when rubbed under conditions of heat, moisture and pressure.

ROVING—Slightly twisted wool sliver in the first stage of manufacturing felt.

CARDING—An operation which converts loose, clean wool into continuous untwisted wide webs.

WIRE CLOTHING—A covering for carding cylinders consisting of numerous steel wires set in canvas in a brush-like formation used to comb or straighten wool fibers.

BATTING—Slightly matted layers of wool webs.

HARDENING—The process of matting the carded batt by tangling the fibers with moisture and heat to a thinner, more dense consistency, creating some strength.

FULLING—The operation of shrinking and felting a fabric to give it body or density.

SPLITTING RESISTANCE—The ability of a finished felt to resist separating through its internal thickness through length or breadth.

shaft end of the fulling hammers have been improved and these machines, also, are constructed more rigidly, although the principle of operation remains unchanged.

Another great refinement in the manufacture of felt is the important "first" operation of washing. Agents for determining the acidity or alkalinity of the felt are now used which make it possible for the worker on this operation to know at any instant the condition of the felt being processed. The same improvements made in scouring also apply here. It is absolutely essential to produce felt that is acid free when it is intended for certain applications. For example, some time ago a felt washer was used in a magneto which failed in operation. Failure was finally traced to the fact that there was some acid in the felt which damaged the facing. The method now used is to neutralize the felt completely, obviating such damage to equipment.

Substantial improvements also have been made in final finishing of the material. As one felt plant superintendent commented to the author, "It's now *control* all along the line." In the drying of felt, for instance, the tendency now is to use more air at lower temperature. Better conditioning of the material results, leaving the felt in a more natural condition; in other words, the felt retains very desirable original properties of the raw material.

With regard to finishing, the tendency has been in years past to favor the practice of pressing the felt to finished thickness. This, it has been found, tends to make the felt brittle. The method presently favored is to eliminate as much pressing as possible and to achieve the finish-thickness by grinding inasmuch as grinding makes it possible to maintain uniform thickness of each piece. Improvements in abrasives such as greater uniformity and a wider choice of grades are another example of progress in an unrelated field responsible for better felt. Finally, inspection has been emphasized more and more, so that today rigorous inspection is a vital phase of almost every step of manufacturing.

Refinements such as these have made it possible to

Felt Components for Motor Vehicles

ENGINE

Timing gear case cover washer (oil seal)
Water pump packing (water repellent impregnated)
Main bearing seal rear crankshaft (divided seal)
Tappet oiling wick

CHASSIS

Front hub grease and dust exclusion seal
Axle pinion bearing seal (supplementary)
Axle shaft seal
Clutch cross shaft washer
Transmission seal (supplementary)
Propeller shaft seal
Torque tube seal (supplementary)
Universal joint seal
Spindle bolt dust washers
Gas tank filler pad
Brake shoe anchor pin dust washer
Clutch housing pan dust seal
Brake shoe adjusting pin wick
Rear wheel seals (truck)

BODY

Anti-squeak, anti-rattle, insulation and weather seals

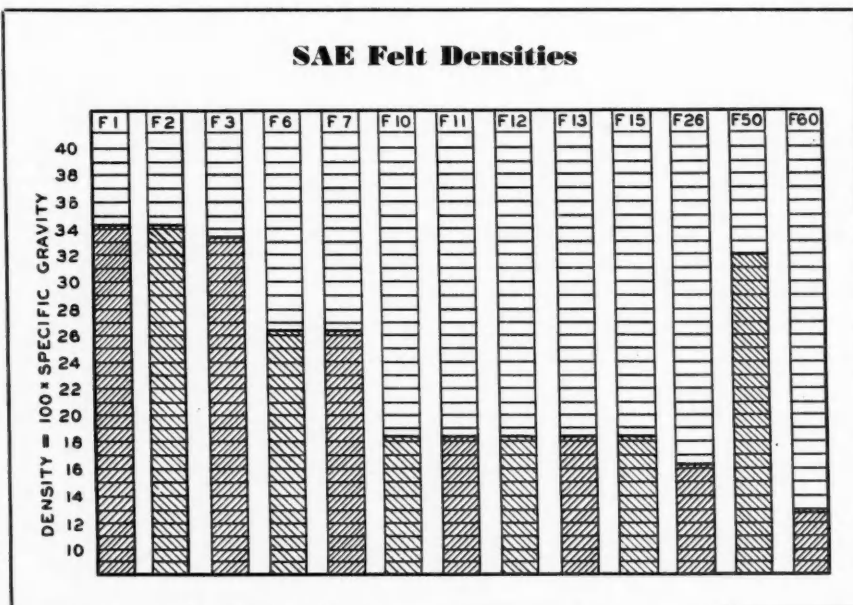
Steering column and pedal plate pad
Trunk compartment panel anti-rattle and dust exclusion strip
Dash insulator and floor carpet pad
Fender skirt to frame anti-rattle and filler pad
Wheel housing to rear quarter panel filler
Door lock anti-rattle pad
Louver cover gaskets
Floor panel anti-squeak shims
Window channel slide rails and bottom bumper strip
Leather top deck padding
Body finish polishing units for flexible shafts

Trim supplementary items

Seat cushion and back piping (riser) filler
Cushion relief design filler foundation
Door panel riser filler
Seat back top roll pad
Seat back top rail pad
Garnish molding padding strip
Windshield header headlining pad

Miscellaneous Equipment Parts

Generator wicks and dust seals
Starter wicks
Shock absorber supplementary seals
Windshield wiper washers
Steering gear dust exclusion washers
Oil filter elements (crankcase oil)
Diesel fuel filter element
Battery positive terminal anti-corrosion washer
Plate glass polishing



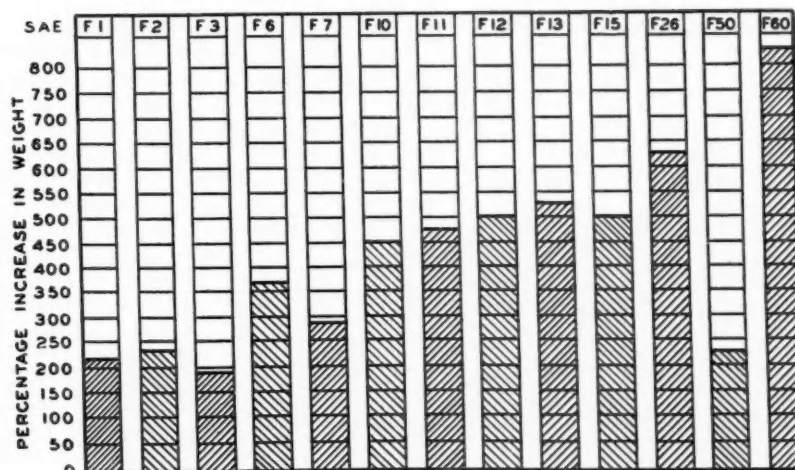
produce precision felt components for transportation equipment. The whole point was summed up recently in the following statement by a felt executive. "Ten years ago a great many felt parts were introduced into the automotive vehicle simply through engineering error. There was space to fill, and felt was used to fill it. Today, however, space is designed for a precision felt. While this felt is much more expensive it does a superior job and a smaller piece will be required, with the result that total cost may be even lower."

Let us examine in detail the present method of manufacturing felt. Fundamentally the process involves the elements of the primitive methods which called for the use of a

large mat upon which the wool was ranged in layer upon layer to desired thickness. To obtain the desired quality of surface texture in the final product, a finer quality wool was usually used on the top layer. A fulling agent of grease or oil was mixed with water and sprinkled on the wool and then pressure was applied in various ways, sometimes by stamping with the feet, pounding with the back of the forearms, or beating the wool with sticks. This pressing or hammering was continued for about four or five hours, the mat of wool being constantly rolled and rerolled from opposite ends. By this primitive process the fibers of wool were slowly and painstakingly felted together. Finally, the piece was washed, dried and stretched. Various peoples used the material for a great variety of purposes, such as garments, tents, hats, boots, blankets, carpets, trappings for horses, packing for merchandise, and door curtains. In some tribes felt is even today held in high esteem not only for its utilitarian value, but because it is associated with religious and ceremonial practices.

The felt now used in motor vehicles is, of course, made by a process which has been highly refined by long years of experience and numerous inventions of equipment and materials, some wholly unrelated. As previously mentioned one of the most important factors in the production of the precision felts available

Absorption of Oil by SAE Felts



today is the careful control of the raw material. Let us consider the constituents of a typical blend of raw materials to be processed into a felt which is used in the automotive vehicle.

The specification we have in mind calls for two wools of about the same grade: a California and a Texas wool. The California stock is regarded as a good felting wool; it imparts thickness and provides excellent cushioning. The Texas wool imparts hardness; further, it provides the final properties of excellent splitting resistance and high tensile strength. The third constituent is called a Garnet stock, which is made of soft clips from a stock already carded. This wool is introduced because it is tar-free. And why should there be tar in sheep wool? Here's the reason. For identification on the ranges, cattle are branded with a hot iron, sheep with a marking tool dipped in pitch or tar. Some ranchers are now using lacquers and synthetic paints to brand sheep in order to eliminate the tar from the raw material as it has been found that lacquers and synthetic paints are much easier to remove from the wool.

Fourth constituent in the blend under consideration is Noil, a shorter wool fiber that's too short to spin into yarn but makes an excellent binder to blend with long stocks. In preparing stock for worsteds, the wool is passed through combs which separate the long fibers from the short. For worsteds it is necessary to have long fibers and the short fibers are discarded. In the final blend there will be approximately 50 per cent long fiber wool, 25 per cent medium length stock, and 25 per cent of short fiber stock. The fibers in this blend would average about one inch in length. The short fibers stand erect through the thickness of the felt and tie together the longer fibers which tend to lay parallel.

Various materials are blended with wool to obtain certain qualities in the final product. Rayon adds to the tensile strength of felt, but the manufacturers try to avoid its use because—as a plant superintendent commented—"the rayon variable is not constant enough." Rayon fibers are quite long and the material

SUPPLIERS OF FELT FOR AUTOMOTIVE USES

Aetna Felt Co.
200 Centre St.
New York, N. Y.

American Felt Co.
315 Fourth Ave.
New York, N. Y.

Bacon Felt Co.
Winchester, Mass.

Booth Felt Co.
463 19th St.
Brooklyn, N. Y.

The Felters Co.
210 South St.
Boston, Mass.

James H. Rhodes & Co.
157 West Hubbard St.
Chicago, Ill.

Standard Felt Corp.
Alhambra, Calif.

Western Felt Works
4029 Ogden Ave.
Chicago, Ill.

American Specialty Supply
Co., 124 East 24th St.
New York, N. Y.

T. R. Brawley Felt Co.
275 20th St.
Brooklyn, N. Y.

Belvidere Felt Mills
P. O. Box 124
Belvidere, N. J.

Byfield Felting Co.
217 Jackson St.
Lowell, Mass.

Commonwealth Felt Co.
76 Summer St.
Boston, Mass.

Continental Felt Co.
890 Broadway
New York, N. Y.

Felt Parts Co.
351 Jay St.
Brooklyn, N. Y.

Felt Products Co.
Chicago, Ill.

Fidelity Felt Co.
Pike St.
Philadelphia, Pa.

K. F. Griffith Co.
110 East 42nd St.
New York, N. Y.

Lowell Felt Co.
Lowell, Mass.

National Felt Co.
Taunton, Mass.

Sutherland Felt & Leather
Co.
Detroit, Mich.

Tilley Felt Co.
Los Angeles, Calif.

ADHESIVES FOR FELT APPLICATION

Type of Adhesive	Solvent	Fiber	Cast Iron	Steel	Stainless Steel	Nickel	Glass	Copper-Brass	Aluminum	Paint	Lacquer	Varnish	Oiled Wood	Plaster	Unglazed Paper	Pressed Cork	Leather	Dull Rubber	Thiokol	Felt to Felt	Wood	Cotton Cloth	Wool Cloth	Silk Cloth	Rayon Cloth	Celotex	Marble	Chromium Plate	Glazed Pottery	In Oil	In Water
Solvent Gum	Toluol Xylo	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Sodium Silicate	Water Alkalies	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Solvent Gum	Petroleum Naphtha Gasoline	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Glue	Water	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Paint	Water Alkaline solutions	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Latex Mixture	Ammonia	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Glue Mixture	Water Ammonia	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Synthetic Resin	Acetone	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Solvent Gum	Petroleum Naphtha Gasoline	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Latex	Ammonia	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Solvent Gum	Petroleum Naphtha Gasoline	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Rubber Cement	Benzene Naphtha	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Solvent Gum	Acetone	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Solvent Gum	Petroleum Naphtha Gasoline	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Solvent Gum	Petroleum Naphtha Gasoline	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Shellac	Alcohol	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*

does have good felting properties. New wool used as a raw material enhances the splitting resistance of the final product.

Other materials sometimes blended with wool are cotton and Celanese. Cotton reduces the cost of the final product, affects its color, and also adds strength. Celanese has the same effect as Rayon. It should be pointed out that a small quantity of cotton is not detrimental to a good piece of felt, does not detract from its wearing qualities. In light-weight felts where the fulling stage is not carried very far, an addition of cotton up to 15 or 20 per cent would, in fact, add to the wearing qualities of the final product. Silk is sometimes used. In general practice, short fiber silks are employed which add greatly to strength because the silk is much finer than the wool or cotton fibers. Actually, the silk fibers are approximately eight to ten times finer than wool.

Raw wool received at the factory contains some foreign matter, chiefly small bits of wood. The material is scoured and carbonized. There are two carbonizing processes. One is referred to as an alumina-base chemical process and the other as a sulfuric acid process. Raw wool containing the impurities, principally bits of wood, referred to in the trade as "sticks," is soaked in one of these solutions for a few hours. The chemical chars the "sticks," then the acid is washed out with soda ash and the wool is given a water rinse. Subsequently the stock goes through a baking machine which breaks up all extraneous matter

which has been carbonized. The impurities now in the form of dust are shaken out, leaving wool free of "sticks" and vegetable matter. While this has been standard practice for a long time, the process is regulated much better than it was only a few years ago.

Picking, processing and blending of the raw material are the first steps in the manufacture of felt. Emphasis on the quality of the raw material is increasingly stressed. Different qualities of wools are obtained from various parts of the world, such as Australia, England, Wales, Iceland, New Zealand, South Africa, India, South America, China, and the Americas. In blending, stocks of various kinds are selected to get the desired result. They differ in grade, length and shape of the individual fiber.

Actual felting together of the fibers is obtained by the tendency of the individual fibers to coil, tangle, and knit together when subjected to moisture, heat, and pressure. A wool fiber viewed under the microscope would be observed to have a series of serrations or scales, and in the processing the serrations of one fiber interlock with the opened serrations of adjoining fibers.

Blending is done in mixing or picking machines from which the raw stock is blown through metal ducts to the carding machines. The carding machines comb out the wool, so that the fibers lie approximately parallel. The straightening out of the fibers is accomplished by the combing action of wire cloth mounted on rolls. The wool comes off the carding

machine in a thin, gossamer-like web which has been built up on an apron about 80 in. wide. The cobweb-like strips of wool are automatically placed, one layer on top of another, until a pile of the filmy carded stock of a certain weight for the desired thickness of the final product is obtained. This web of material is rolled up on a stick to form what is called a batt. In most plants it is general practice to feed the webs onto the apron in such manner that the combed fibers are laid perpendicular to each other in layers, so that the finished piece will have the same strength in length and breadth.

Batts are then moistened with water and steamed. The material is again leveled out on an apron and passed under a platen which subjects the mass of fibers to pressure and an oscillating motion. The platen is designed so that it may describe an oscillating pattern of motion in L-shape, T-shape, circle or figure eight. It should be pointed out, too, that the canvas cover on the platen has an important effect on the final surface texture of the manufactured product. This operation reduces the thickness of the batt of fibers about 90 per cent. Application of heat and moisture opens up the serrations of the individual fibers of wool so that when the fibers are pressed and vibrated the individual fibers become thoroughly interlocked.

The material taken off the hardening machines, now a cloth-like product, is placed in the fulling mills. Into the wooden tubs of these machines the felt is placed and subjected to the repeated blows of large wood hammers operated by a crankshaft at the top of the machine. Heat plus the vibrating action of the hammers shrinks the fabric, further binds together the

wool fibers, and the felt comes out of this machine a harder, firmer fabric. The mats of wool are pounded in this machine for anywhere from ten minutes to a half hour during one run. They are removed, straightened to prevent wrinkling, and again subjected to the same process. The longer the mat of felt is subjected to the action of the fulling machine, the harder will be the final product. Shrinkage is greatest in the first few runs when the wool quickly tightens up with the aid of soaps and mild acid solution. A 40-yd. piece of material, say 80 in. wide, may be reduced to a piece 24 yds. long by 60 in. in width. The pieces are shrunk to somewhat under final size inasmuch as some stretching occurs in subsequent processes of scouring and dyeing.

When the fulling process is completed, the felt is scoured. This is accomplished by subjecting the material to the action of water and ammonia solution as it is passed through squeeze rolls. Sometimes this operation requires only a few minutes, in other instances it may occupy an hour, depending upon the type and thickness of the fabric. If the material is to be dyed, the dyeing is done at this point. Then the felt is dried either in tenter machines which will stretch and hold the felt to size as it dries, or in centrifugal machines. The felt is then sheared or surface ground. Finally, this material is ironed on cylinder presses.

Why has felt consistently maintained its position for centuries as a "modern" material? The answer will be found in the long list of very desirable properties possessed by felt. Briefly, it is resilient, and will absorb sound, vibration and shock. It may quite easily be cut to shape inasmuch as it is manufactured into a solid mass and not woven. The cut edges of felt will

CHEMICAL AND PHYSICAL PROPERTIES OF FELT

S.A.E. Specification Number	Trade Name	Color	S.A.E. Specification Min. Wool Content Fibre Basis	S.A.E. Specification Max. Cotton Content Fibre Basis	Min. Wool Content Chemical Basis A.S.T.M. Method	Max. Carbon Tet. A.S.T.M. Method	S.A.E. Specification Max. Water Soluble A.S.T.M. Method	S.A.E. Specification Max. Ash A.S.T.M. Method	Proposed Changes S.A.E. Spec. Ash	Maximum Non Fibrous Imp.	Min. Splitting Resistance in lbs. A.S.T.M. Method (2" Wide Strip)	
			%	%	%	%	%	%	%	%	W 36	L 33
F-1	Back Check	White	100	..	95	2.5	2.5	0.75	...	3.0	36	33
F-2	Back Check	Any ex. grey or black	100	..	95	2.5	2.5	1.0	...	3.5	34	31
F-3	Back Check	Grey	95	5	95	2.5	2.5	1.25	...	3.5	25	24
F-6	Extra Firm Pad	Grey	100	..	95	2.5	2.5	0.75	1.0	4.5	23	22
F-7	Extra Firm Pad	Grey	85	15	80	2.5	4.0	1.0	1.5	7.0	14	12
F-10	Firm Pad	White	100	..	95	2.5	2.5	0.75	...	3.0	12	8
F-11	Firm Pad	Grey	100	..	95	3.0	2.5	1.25	...	4.5	10	6
F-12	Firm Pad	Grey	90	10	85	3.0	2.5	1.25	1.75	6.0	2	2
F-13	Firm Pad	Grey	80	20	75	4.0	2.5	1.25	1.75	7.0	1	1
F-15	Firm Pad	Grey	60	40	55	4.0	3.0	1.5	2.0	9.0	1	1
F-26	Unfulled Pad	Grey	50	50	45	...	3.0	1.5	2.5	12.0	..	..
F-50	Ball Bearing	White	100	..	95	2.5	2.5	0.75	1.0	3.0	..	..
F-60	Packing Felt	Grey	50	50	40	...	3.5	5.0	1.0	12.0	..	..

Of the materials listed in the table, back-check, extra-firm pad and firm-pad felts are recommended for use in washers, bushings, oiling wicks, door bumpers, chassis strips and similar parts. Soft pad felt is intended for body parts, and seat and back decorative motifs. Ball bearing felt is intended for use as ball and roller-bearing oil reservoir washers and for use where an accurate, thin, smooth high-grade felt is desired. Packing felt is intended for such application as soft top-padding and silencing parts in body construction.

It should be noted that wool content on the "fiber basis" is calculated after removal of all non fibrous materials, whereas the wool content on the "chemical basis" is figured as a percentage of the total manufactured weight of the felt.

*Specifications proposed and recommended as standard by a prominent felt manufacturing company.

not fray, hence require no binding. It can store oils and other liquids; it may be moth-proofed, fire-proofed and water-proofed.

It is possible to control the manufacturing process so that the final felt product will be springy soft or rock hard. Commercial felts today have wool contents from 25 per cent to 100 per cent. Thickness ranges from 1/16 in. to 3 in.; width 30 in. to 80 in.; length, subject to thickness requirements, up to 80 yards; and weight will vary from 3 oz. to 65 lb. per sq. yd. It is now possible to produce a surface smooth or rough to suit, introduce many different chemical treatments to cope with various industrial requirements.

In describing the improvements in felt we did not mention previously the ability of the felt manufacturer to meet much closer tolerances with his product. Present equipment makes it possible in the higher grades to meet weight and thickness tolerances which produce felt with guaranteed five one-thousandths of an inch thickness tolerances.

There are literally hundreds of uses for felt in automotive, aircraft and marine applications. For

automobiles we append a partial list on page 598. With regard to aircraft, felt can be employed for an almost equally wide variety of uses. One of the latter is the use of felt in the mountings for fuel tanks. The relatively large loads of gas tanks are supported on a fairly small surface and it is important that vibration and chafing be minimized. Hence, supporting cradles for aircraft fuel tanks are frequently lined with felt in thicknesses ranging from 1/4 to 1/2 in. Vibrations and chafing of fuel lines is prevented by supporting them with felt pieces. Where aircraft must operate in especially severe weather conditions the entire fuel system may be encased in felt to boost the operating temperature. There is, also, a self-lubricating engine control system which has been designed so that the control rods operate through felt which has been saturated in oil, and binding does not occur because the felt support is flexible.

Aircraft cabins are sometimes lined with flame-proofed kapok felt having a record K factor of 0.21. In this application the felt serves two purposes: it

(Turn to page 620, please)

Automotive **MATERIALS**

NEW DEVELOPMENTS

Distributing Data Sheets On New Wrinkle Finishes

Data sheets, giving general and technical information on Wrinkle Finishes, are being distributed by Maas & Waldstein Co., Newark, N. J., makers of industrial finishes.

The finishes are supplied in all colors, including pure white, light shades, and pastels, and, being of low viscosity, they have greater covering power and can be applied with a uniformly fine grain, as well as coarse and heavy structures.

The data sheets cover many details, such as spraying air pressures, baking times and temperatures, method of obtaining various kinds of wrinkles and patching.

Sherwin-Williams Offers New Enamel

The Sherwin-Williams Co. of Cleveland, Ohio, has issued a 24-page pictorial and technical report entitled "From a Cleveland Laboratory." Its pages contain a description of S-W Kem Lustral Enamel, a new finish that can be brushed, sprayed, dipped, air-dried or baked, and applied to wood or metal surfaces subject to exterior or interior exposure. Kem Lustral is said to produce a smooth, mirror-like finish and to maintain its toughness, gloss and color exceptionally well under exposure.

Chief advantages claimed are greatly simplified

finishing schedules, lowered inventories for manufacturers, and new opportunities to improve quality and cut costs on finished units. Kem Lustral Enamel is said to be made from a completely new kind of synthetic resin.

Paint with Rubber Base For White Sidewall Tires

The B. F. Goodrich Co., Akron, Ohio, has announced a new white sidewall tire paint applicable for renewing white sidewall tires or for making present black sidewalls white.

Made with a rubber base, the new paint is self-vulcanizing, is elastic and thus flexes with the tire and will not crack or chip. It is applied with a brush, dries quickly and can be washed with soap and water without affecting its original whiteness.

Beryllium Alloys in Rod, Wire and Strip Form

The Beryllium Corp. of Pennsylvania has completed installation of new facilities at its Reading, Pa., plant for the commercial production of heat-treated beryllium alloys in rod, strip, and wire forms. Hitherto, the company has supplied master alloys only in the ingot and cast form. The new facilities make it possible for the company to supply 2-2.26 per cent beryllium-copper, beryllium-cobalt-copper, beryllium-chromium-copper, beryllium-nickel, and other alloys in the primary fabricated shapes.

AUTOMOTIVE INDUSTRIES

Just among Ourselves

A FEW years ago there appeared a book with the title "They All Sang." A few weeks ago we discovered that the phrase had especial significance for the cradle days of the automobile industry. Onward from 1900, Tin Pan Alley became increasingly conscious of the horseless carriage as a subject for popular songs. A few of the songs were extraordinarily successful; nearly everyone remembers "In My Merry Oldsmobile," for example, with words by Vincent Bryan and music by Gus Edwards. Both boys were tops in song writing in their day, which may explain why the song survived so much longer than most others of the same kind. Edwards later achieved considerable celebrity via vaudeville, revues and records of "Ukulele Ike."

Other song titles from the earlier days of the automobile which still tug a little at the memory are "The Little Ford Rambled Right Along" (words by C. R. Foster, music by Byron Gay) and "He'd Have to Get Out and Get Under," which was written by Grant Clarke, Edgar Leslie and Maurice Abrahams, and sung with terrific success by one Bobby North in the naive, nostalgic days just preceding the Great War. There is a German version of this song which was just about taking hold when the War broke out.

Which leads to the reflection that it is possible that songs about automobiles would have had a longer vogue if it hadn't been for the War. New songs came in on the War wave, and when it was all over, it left in its wake the "blues" and the "torch song," and people were much too sophisticated to get excited about a song with a title like "I Love My Horse and Wagon, but Oh, You Buick Car." Buick did all right in spite of the profound social upheaval which could

produce such a phenomenon, but there were other manufacturers of the same period whose only memorial is a gaudy song sheet. Who now remembers songs with titles like these: "The Peerless March," "No Hill Too Steep, No Sand Too Deep" (which was the Jackson slogan, as well as the company-song title), "In My Rickenbacker Car," "Give Me a Spin in Your Mitchell, Bill," "Cole 30 Flyer," etc.?

Nearly all the songs which were written and sung in the United States, which had the automobile for subject, or which have been concerned with promoting a single make of car, have been assembled by Malcolm Newton Stone, of West Englewood, N. J. Altogether Mr. Stone possesses something like 70,000 song sheets ranging from the music which was sung at George Washington's funeral to some of the forgotten hotcha of yesterday.

Only a minute fraction of the songs are concerned with automobiling, but the automobile portion of the collection seems to include the works.

Sometime later we hope to be able to show you in the form of pictures what some of the old automobile songs looked like, and what the words were. The cover of one of them is shown on this page.

New Note in Racing Song

It seems paradoxical to speak of automobile safety and automobile racing in the same paragraph. Yet we have a feeling that the future of American automobile racing depends to a certain extent on the casualty list at the Indianapolis Speedway on May 30. The fewer the casualties on that day, the less likely is automobile racing to be hedged with judicial and legislative restrictions in the future.

This feeling springs from the fact that during the past year, because of rather gory accidents at smaller tracks, judicial notice has been taken of the fatality record of automobile racing. The question has been asked many times, and from many sources, how many people, both drivers and spectators, have been killed and injured in automobile racing. To this question, so far as we know, there is no authoritative answer. The important thing is that the question is being asked more frequently and with marked emphasis.

The Contest Board of the American Automobile Association has established safety rules governing the conduct of automobile races for which it issues a license. These rules undoubtedly contribute to a reduction of the useless hazards of the track. At Indianapolis these rules are pretty well policed. At the smaller tracks, this is not always true, either in the spirit or the letter of the rules.—HERBERT HOSKING.



Men and Machines . . .

Wendell E. Whipp Lauds

CRITICS who claim that the machine tool industry does not spend enough money on research were quietly but firmly refuted in a speech delivered at the recent Chicago meeting of the National Machine Tool Builders' Association by Wendell E. Whipp, president. Mr. Whipp pointed out that the very nature of the machine tool industry precludes construction of laboratories for highly specialized research. Machine tool builders do have, however, new ideas and methods constantly on test in their plants. These ideas and methods are tried out under actual shop conditions to make sure that they will justify consideration as part of a redesigned machine, or as a basis for a new line of machines. "Our own plants and the plants of our customers," said Mr. Whipp, "are the research laboratories of our industry. Isolated research programs are more conspicuous, but the total expenditure of the machine tool industry in research, experiment, and in redesign is very substantial."

Emphasizing "Change" as an inevitable part of the picture for the machine tool builders, the Association's president admitted that frequent redesign is an expensive part of the machine tool business. He added, "The machine tool builder looks forward to further changes, not merely in his own affairs but also in the important national factors that enter in so large a measure into his own outlook and into his own policies."

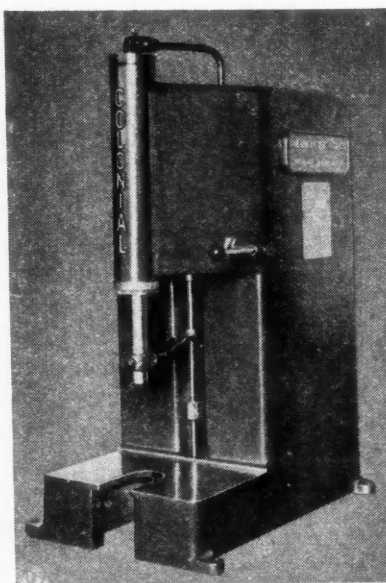
"He looks forward to a change in the labor situation to a more rational understanding; a labor situation in which difficulties will be adjusted as quickly as possible and without unduly penalizing the worker or his employer; a labor situation in which the worker will understand that there must of necessity be a definite link between his output and the wages he secures and that any attempt to set aside economic law by contract, by agreement, or by legislative enactment is destined to injure the worker more than anyone else."

"He looks forward to a change in the nation's tax policy, which indeed is under consideration today, so as to encourage rather than stifle the growth and development of American industry."

"He looks forward to a sincere attempt to support

industry as a national source of employment and prosperity and the abandonment of governmental shortcuts that we cannot afford to continue.

"No matter how eagerly we may anticipate the changes that will widen our field or opportunity, we must make the most of the opportunities that are near at hand. The situation calls for a new and vigorous emphasis on sales. We must bring home to our friends in the metal-working industry a new realization of the tremendous possibilities of increased earnings that lie in the installation of improved machinery equipment."



One of a new line of low-cost hydraulic presses both for broaching of small parts and for miscellaneous light assembly work. Colonial Broach Co. is the manufacturer.



Cleveland single disc coil stock cradle designed to handle a 3½-ton coil, 52 in. outside diameter by 20 in. wide as a maximum.

Mr. Whipp also remarked in the course of his speech that "Machine tool builders are particularly ac-

customed to changes in the design of the equipment that they build." This last quote is mild understatement, judging by the steady stream of announcements of new developments in this field that constantly pours into the *Men and Machines* mailbox. We were especially intrigued by a new measuring machine which operates on an entirely different principle from equipment heretofore employed for checking involute shapes.

Machine Tool Research; Stresses Increased Earning Power of Improved Equipment



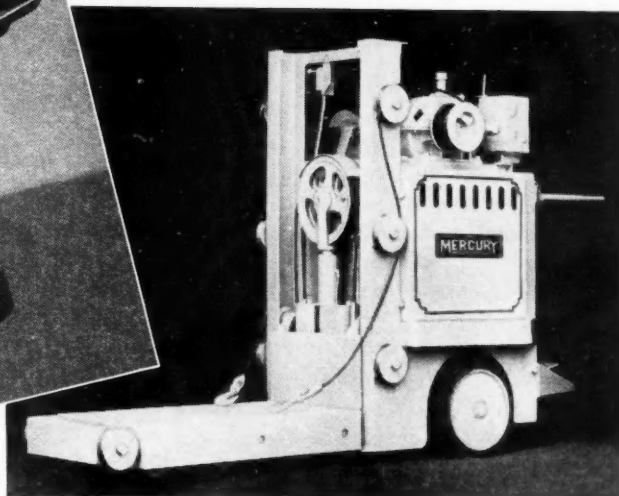
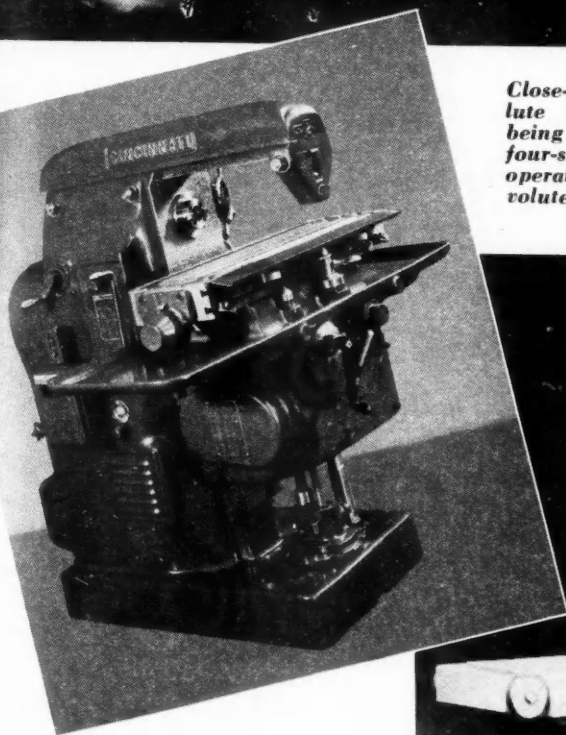
Close-up of Fellows involute measuring machine being used to check a four-step cluster gear. The operator is setting the involute pointer in "Starting" position.

This machine operates without the use of base rolls, tapes, or sine bars, and instead employs a master involute cam. The position of the main slide is set with standard size blocks, and automatically locates the involute pointer at the correct base circle radius for any gear within the capacity of the machine. Another block sets the involute pointer in the so-called "starting" position. Provision is also made for checking tooth modifications, a graduated dial being employed in connection with the dial indicator. It is also possible to check both sides of the teeth without removing the gear from the centers. The involute pointer is rotated in the holder and the dial indicator swung to the reverse position. The lever that operates the dial indicator is in the form of a "Vee" so that contact can be made with the indicator for checking both right- and left-hand sides of the teeth.

The operation of the machine does not rely upon friction, and consequently, gears of small diameter can be checked just as accurately as gears of larger size without any special care being taken. Another feature is that this machine can be used to determine a base circle of unknown diameter.

Of simple design, the machine is easily operated. For example, a four-step cluster gear, such as shown in the illustration, can be handled without removing the work from the centers; that is, the teeth on all four steps can be checked at one setting of the work. This is made possible by having the work spindle capable of elevation and the tail center adjustable. The tail center is the "live" type, and as the handle is provided with a weight, it is not necessary to use a driving dog to keep the work following the driving center. In changing from one gear to another, only two main settings are required; namely, setting the main slide at the correct base radius, and setting the pointed slide in the

provided with a weight, it is not necessary to use a driving dog to keep the work following the driving center. In changing from one gear to another, only two main settings are required; namely, setting the main slide at the correct base radius, and setting the pointed slide in the



Cincinnati's newest offering for the rapid milling of small parts at the left and an electric industrial elevating platform die handling truck built by Mercury Mfg. Co. It is rated at 4000 lb. capacity.

starting position. Gears up to 6 in. pitch diameter can be checked on this equipment, and the indicator pointer holder has a movement of $3\frac{1}{2}$ in. The machine represents one of a series of involute checking machines to be announced later by the Fellows Gear Shaper Co., Springfield, Vt.

Two new plain automatic milling machines introduced by the Cincinnati Milling Machine Co., Cincinnati, have been designed for the rapid milling of small parts. Features are dog controlled automatic table cycles with intermittent feeds, a hydraulic back lash eliminator, an automatic spindle stop, screw feed to the table and single lever finger tip start and stop lever for the table.

Sixteen spindle speeds, obtained through heat treated pick-off gears and a back gear, from 50 to 1500 r.p.m. are standard. An alternate range of 40 to 1500 r.p.m. can be supplied. Easily accessible for

changing spindle speeds, the pick-off gears are located in a protected compartment in the left side of the machine column. Rotation of the spindle may be started or stopped by a control lever located on the left of the column. An automatic spindle stop, actuated at the end of the table cycle to prevent mishaps from revolving cutters during loading operations, is available at extra cost. The enclosed motor drives a constant speed pulley through multiple vee belts and a hinged motor mounting compensates for belt wear.

A standard range of sixteen table feeds from $\frac{3}{4}$ in. to 30 in. per min. is standard. A high series from $1\frac{1}{2}$ in. to 60 in. and a low range from $\frac{1}{2}$ in. to $21\frac{1}{2}$ in. can be supplied. All feed changes are obtained by pick-off spur gears.

There is a complete automatic dog-controlled working cycle for the table which includes a 300 in. per min. power rapid traverse. (*Turn to page 622, please*)

PRODUCTION LINES —

Reverse English

We have mentioned on occasion the intense competition between processes and raw materials in modern manufacturing practice. Stampings replace drop forgings, plastics replace stampings, zinc alloy die castings replace stampings and plastics and ferrous castings; then all possible variations of all methods. Comes now a reverse english of the process, to borrow an expression from tennis. A prominent drop-forging concern active in this industry tells us that recently they have been called in to produce drop forgings to replace elements hitherto made by assembling stampings. Prime and unexpected development along this line is the adoption of drop forgings to replace stampings and combinations of stampings and castings welded or brazed together in the structure of transport airships. Interesting it is to note that such forgings are being made with web thickness of only $\frac{3}{16}$ in., with draft not exceeding three degrees. Think that one over.

Coming Events

The stage is seemingly well set for important advances in transmission design. Most motor car manufacturers have made the interim refinements in their gear boxes, principally by facilitating ease of shifting with hand controls under the steering wheel. Now it is only a logical shift to entirely automatic operation. Thus far Oldsmobile is the only one to feature a form of automatic transmission; and they have made some refinements in the unit during the past season. Chrysler will undoubtedly press the issue of the fluid fly-wheel in combination with overdrive. Incidentally, we mentioned some short time ago that a fluid fly-wheel for heavy-duty service is now under development in another quarter. According to the best evidence we have been able to muster, there is an excellent automatic unit available right now that could

be adopted by any manufacturer in the field. In larger capacities, this unit may soon be available for heavy-duty transportation units, principally motor coaches. All of which convinces us that transmissions are due for some major changes within the next couple of years.

Total Counts

Most significant slant on drop forging costs we have had in a long time comes from an executive of one of the oldest forging establishments in the industry. His point is that modern forging practice can have such a marked influence upon machining costs that it is fallacious to compare one make of forging with another or forgings with any other process without taking into account the overall cost of fabricating the part. For example, it is quite conceivable that a new forging may be so designed as to have a higher cost for the forging, alone, taking into account the die costs. Yet the properly designed forging will yield higher overall manufacturing cost by reducing metal cutting operations, sometimes even eliminating conventional machining steps; also by eliminating scrap and chips, producing better balance at less cost. This is too important to be overlooked by either designers or factory executives.

Gas Power

There is a potential market in the city of Detroit, alone, for at least 1000 gasoline engines, converted to burn natural gas for powering air-conditioning units. In recent months a number of Chrysler and Ford V-8 engines have been impressed into this service by industrial power conversions. Utility power economics enters strongly into this picture. Consider that natural gas usage falls off during summer months while electric power demand is unfavorably influenced by the fluctuating demand of many air-conditioning units.

(*Turn to page 616, please*)

1939 PONTIAC SIX-CYLINDER

PASSENGER CAR ENGINE

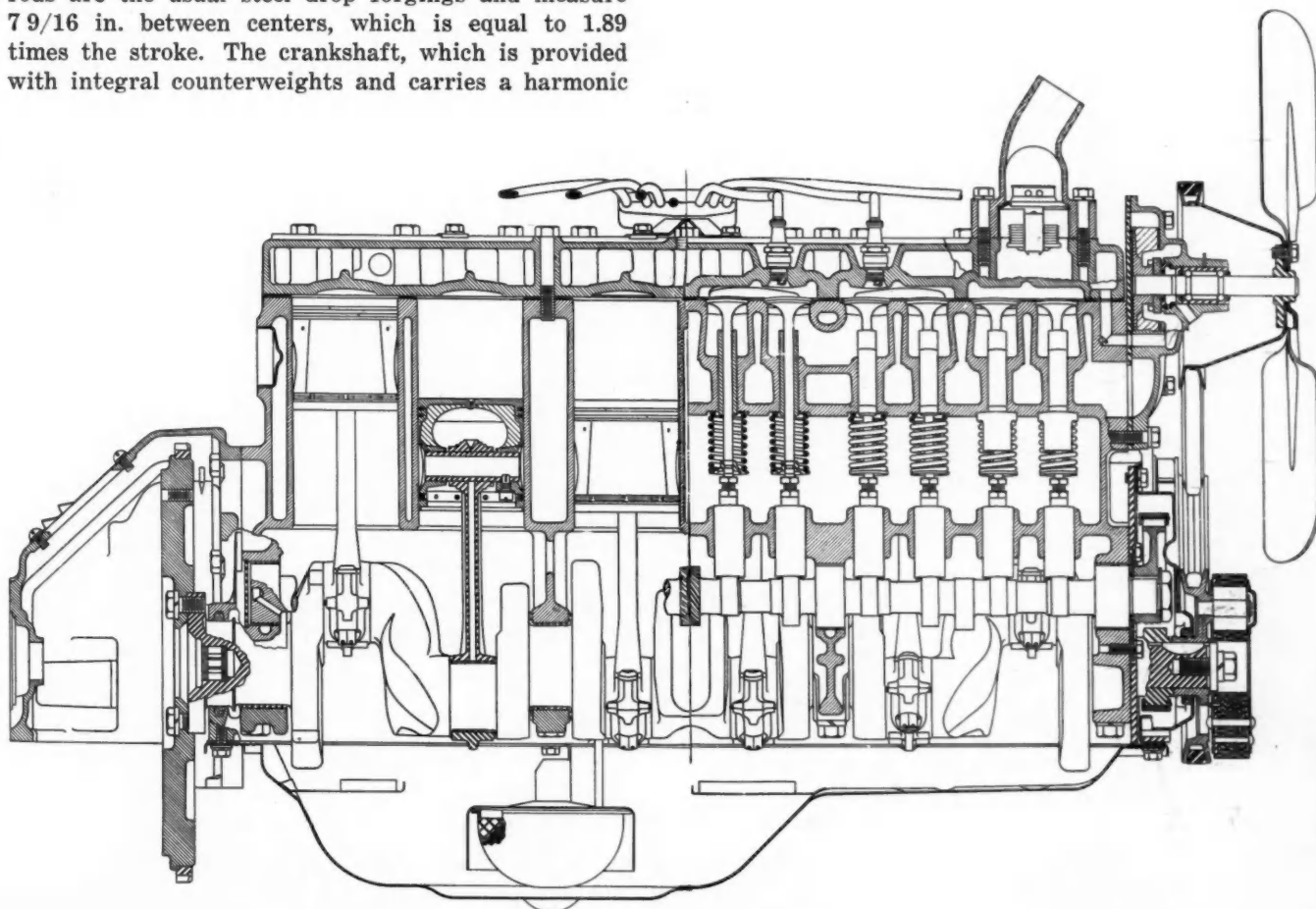
Longitudinal Section

THE Pontiac Six engine, which has a bore of $3\frac{7}{16}$ in. and a stroke of 4 in. (222.7 cu. in.), develops a maximum torque of 161 lb.-ft. at 1600 r.p.m. and a maximum output of 85 hp. at 3520 r.p.m. At the speed of maximum torque the b.m.e.p. is 109, and at the speed of maximum output it is 86 lb. per sq. in. The compression ratio is 6.2 and at 1000 r.p.m. under full throttle the engine shows a compression pressure of 140-143 lb. per sq. in.

Cylinders and crankcase are cast in a single block. Pistons are cast of chrome-nickel iron and are tin-plated. Each carries two compression rings above and one oil-control ring below the piston pin. Without rings and pin the piston weighs 1.67 lb. Connecting rods are the usual steel drop forgings and measure $7\frac{9}{16}$ in. between centers, which is equal to 1.89 times the stroke. The crankshaft, which is provided with integral counterweights and carries a harmonic

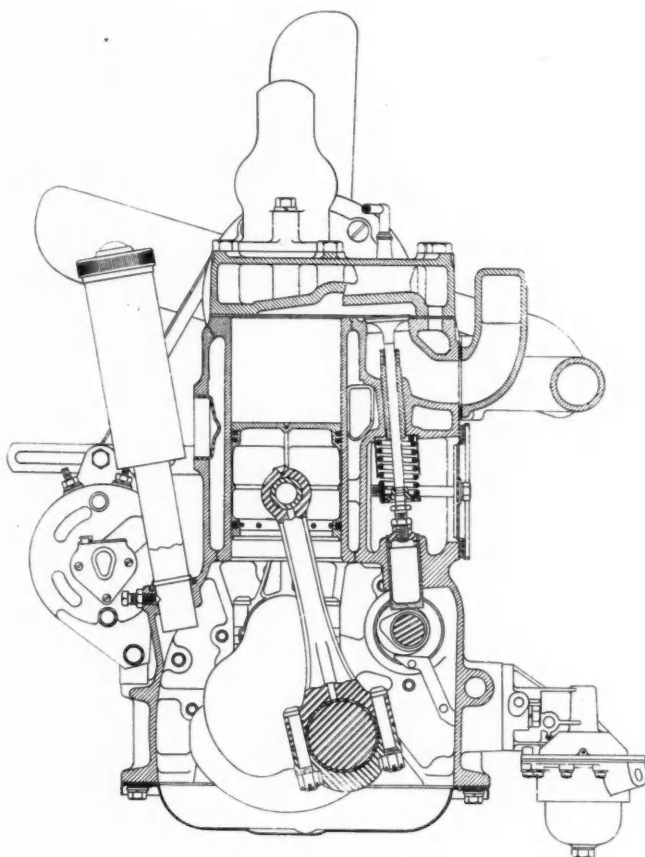
balancer at the forward end, is supported in four main bearings ranging in diameter from $2\frac{1}{2}$ in. for the front to $2\frac{5}{8}$ in. for the rear one. All crankshaft and connecting-rod bearings are of the steel-back, white-metal-lined type. Connecting-rod bearings are $2\frac{1}{8}$ in. in diameter and $1\frac{9}{32}$ in. long. The weight of the finished connecting rod is 2.16 lb. The camshaft, which also is supported in four bearings, is made of cast iron and is driven by a Morse toothed chain.

Inlet valves, which have an over-all diameter of $1\frac{19}{32}$ in. and a lift of $\frac{19}{64}$ in., are made of nickel-chromium steel. Exhaust valves have an over-all diameter of $1\frac{15}{32}$ in. and a lift of $\frac{19}{64}$ in., and they are



Transverse Section

1939 PONTIAC SIX-CYLINDER PASSENGER CAR ENGINE



made of silicon-chromium steel. The valve timing is as follows: Inlet opens 5 deg. ahead of top center and closes 39 deg. after bottom center; exhaust opens 45 deg. ahead of bottom center and closes 5 deg. after top center. Inlet and exhaust valves carry identical springs, which exert a pressure of 54½ lb. with the valve closed and 96 lb. with the valve open.

Lubrication is by pressure to main, connecting rod, piston-pin, and camshaft bearings. At speeds of over 40 m.p.h. the oil pressure is maintained at between 35 and 40 lb. per sq. in. The oil is put under pressure

by a gear pump and the crankcase supply is checked by means of a gage rod. When the atmospheric temperature does not exceed 70 deg. Fahr., the use of 10-W oil is recommended; for use during the warm season, 20-W. To ensure effective cooling of the valves, a water-distributing gallery is set into the cylinder block, which discharges against the valve pockets. Water pump and fan are combined into a single unit which is bolted against the front of the engine block, with the sheet-steel engine bearer in between. The pump is of the ball-bearing, self-sealing type.

New Records Expected at This Year's

Indianapolis Race

(Continued from page 594)

It appears that the Bowes Seal Fast entry, which was built by Louis Meyer, three-time winner of the 500, is now running about as expected. The car is very fast and seems to behave beautifully, although there are no apparent changes of consequence since last year when the car ran very well but showed unsatisfactory speed.

Louis Meyer's car has done 168 m.p.h. on Lake Muroc in California, where the altitude is 2500 feet. With the acceleration this car shows on the straight-aways at the Speedway, it does not seem unreasonable to anticipate that the car has performance beyond that which can be used.

The engines in the two Thorne cars, which were designed and built by Art Sparks last year, remain very interesting. These are highly supercharged six-cylinder engines running on high alcohol fuel and may be expected to be as fast as the track will permit. In fact, it seems likely that there may be least ten cars definitely capable of speeds and acceleration somewhat beyond the limits of the Speedway.

It seems probable at this writing that there will be three other Maserati cars in the race. These cars will be older designs employing V-8 engines which were originally built for superchargers, but which have been modified as to stroke and/or bore, in order to bring the displacement within the present rules limitations. Superchargers have been omitted for the same reason. One of these cars, entered by Deacon Litz, has independent suspension by torsion bars for all four wheels. The other two cars have independent suspension by torsion bars for the front wheels and independent suspension by semi-elliptic springs with universal shackles for the rear swing-axes.

Another interesting entry is the Alfa-Romeo entered by William White. This engine has been considerably modified by Mr. White, and new cylinder blocks have been made since last year's race. These blocks are believed to be the first castings made in America involving the seating of the valves directly in the aluminum of the casting. The only changes made in the design of the block from the original was a small reinforcement at the attachment flange and modifications necessary to permit direct-acting valve followers of what may be called the Miller type in preference to the Hispano-Suize type, originally used by Alfa. It will be remembered that this car ran excellently last year until a piston seized. It may be expected to show a good performance this year.

The three Miller cars incorporate in their design a great many novel features. They are four-wheel drive. They have six-cylinder engines in which the bore is $3\frac{1}{2}$ in. and the stroke $3\frac{1}{8}$ in. The engine is set at a substantial angle, perhaps as much as 45 degrees. This

is done in order to place the crankshaft in a position which will permit taking the power forward to a master transmission from which it is returned back to the rear differential, thus providing a drive for all four wheels with a minimum of machinery.

The engines are unique in that they are more nearly in one piece than has been heretofore deemed practicable. From the parting line of the camshaft housings at the top of the engine to a point substantially below the center line of the crankshaft, and from a parting line incorporating part of the gear cover to a parting line incorporating the bell housing all is one single aluminum alloy casting with the necessary sleeves, valve seats, etc., either cased in or installed after the initial machining of the main casting. Such a structure provides unusual rigidity, and has much to recommend it where cost is of little consideration.

The unusual stroke-bore ratio was dictated very largely by the desire to run the engine at high speeds. We are informed that the engine is expected to develop its peak horsepower at 8000 r.p.m. When first shown, these engines were equipped with three-lobe Roots type blowers, but the induction system has since been modified and they are now equipped with centrifugal blowers having a double rotor and dual inlets. This design has the merit of better efficiency than can be accomplished with the single intake rotor. The supercharger is driven from the crankshaft through the medium of a planetary step-up gear in which the rack, or normally stationary element, is allowed to float within predetermined limits in order to reduce the stress involved by rapid acceleration and deceleration. The cars have independent suspension on all four wheels; the suspension being of the double parallelogram type. These cars are equipped with disk brakes of Mr. Miller's design, the details of which are not known to the writer.

At the present writing only one of these cars has been seen in action at the Speedway. Little is known of its probable performance, but there is little evidence of trouble having been experienced so far this season. The engine appears to be behaving beautifully. In common with all of Mr. Miller's productions, the jobs are clean in design and the workmanship throughout is of an exceedingly high order.

Leon Duray, the former driver, now a designer, has brought through a clever job which has been built at a very low cost. This incorporates a three-liter, highly supercharged, four-cylinder engine; a rather orthodox chassis with inverted transfer springing at both ends; apparently excellent weight distribution and very good geometry, for the various moving elements are all put together in a beautiful body with what appears to be a high degree of streamlining.

Heldt's "High Speed Combustion"

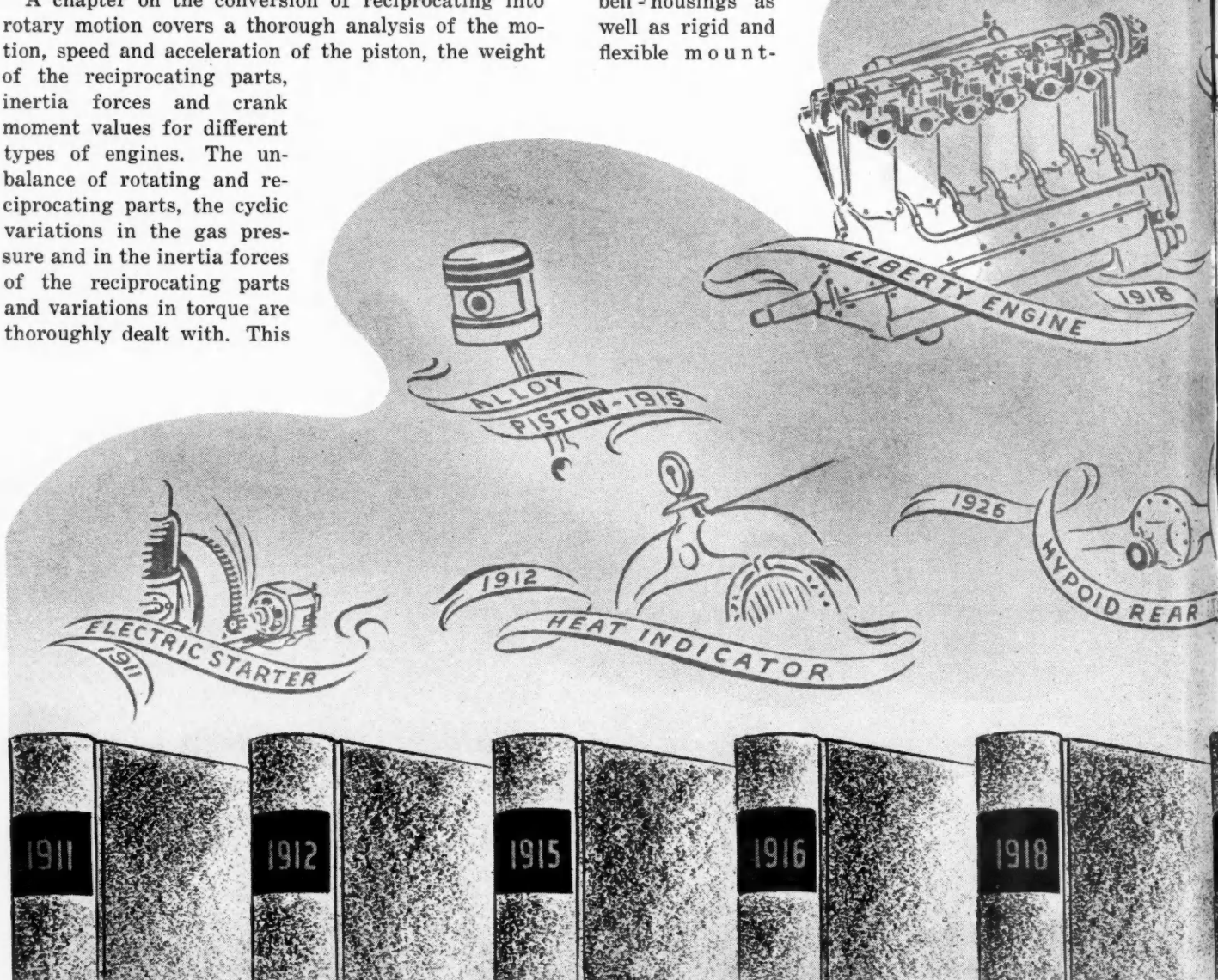
THE tenth edition of any book is indicative of wide popularity and intrinsic value but such a work coming from the pen of the beloved dean of automotive editors and engineers is a signal event in the field of technical publications and a great source of satisfaction to his many friends who honor him for this and his many other accomplishments. The volume, brought up to date, profusely illustrated, rich in fundamental material and formulas including those deduced from modern practice, painstaking in describing the smallest details, in touch with important recent research, it has great appeal for the student, designer and engineer alike.

The introductory section on the Otto cycle including compression and expansion considerations, M.E.P., theoretical and actual indicator diagrams is followed later in the book by a chapter on thermodynamics with its basic fundamentals and in addition such items as air cycle efficiency, disassociation of gases, entropy equations and charts.

A chapter on the conversion of reciprocating into rotary motion covers a thorough analysis of the motion, speed and acceleration of the piston, the weight of the reciprocating parts, inertia forces and crank moment values for different types of engines. The unbalance of rotating and reciprocating parts, the cyclic variations in the gas pressure and in the inertia forces of the reciprocating parts and variations in torque are thoroughly dealt with. This

takes in the study of engines with various number and arrangements of cylinders together with the crankshaft as effecting balance.

The combustion chamber design section includes the latest research developments on detonation, flame travel, turbulence, roughness, pressure rise and spark-plug location. Cylinder design and materials embraces all types of construction and practice through nitrided liners and Stellite-faced valve seats. Cylinder wear considerations, dimensioning, water jacketing, valve position and porting, spark plug bosses, separate and integral cylinder blocks with the crankcase and head design are profusely dealt with. The discussion on the crankcase and engine mountings covers the various forms of case construction, sump, bearing caps, timing case, crankshaft seals and bell-housings as well as rigid and flexible mount-



Engines" Goes Into Tenth Edition

ings including the various methods of utilizing rubber.

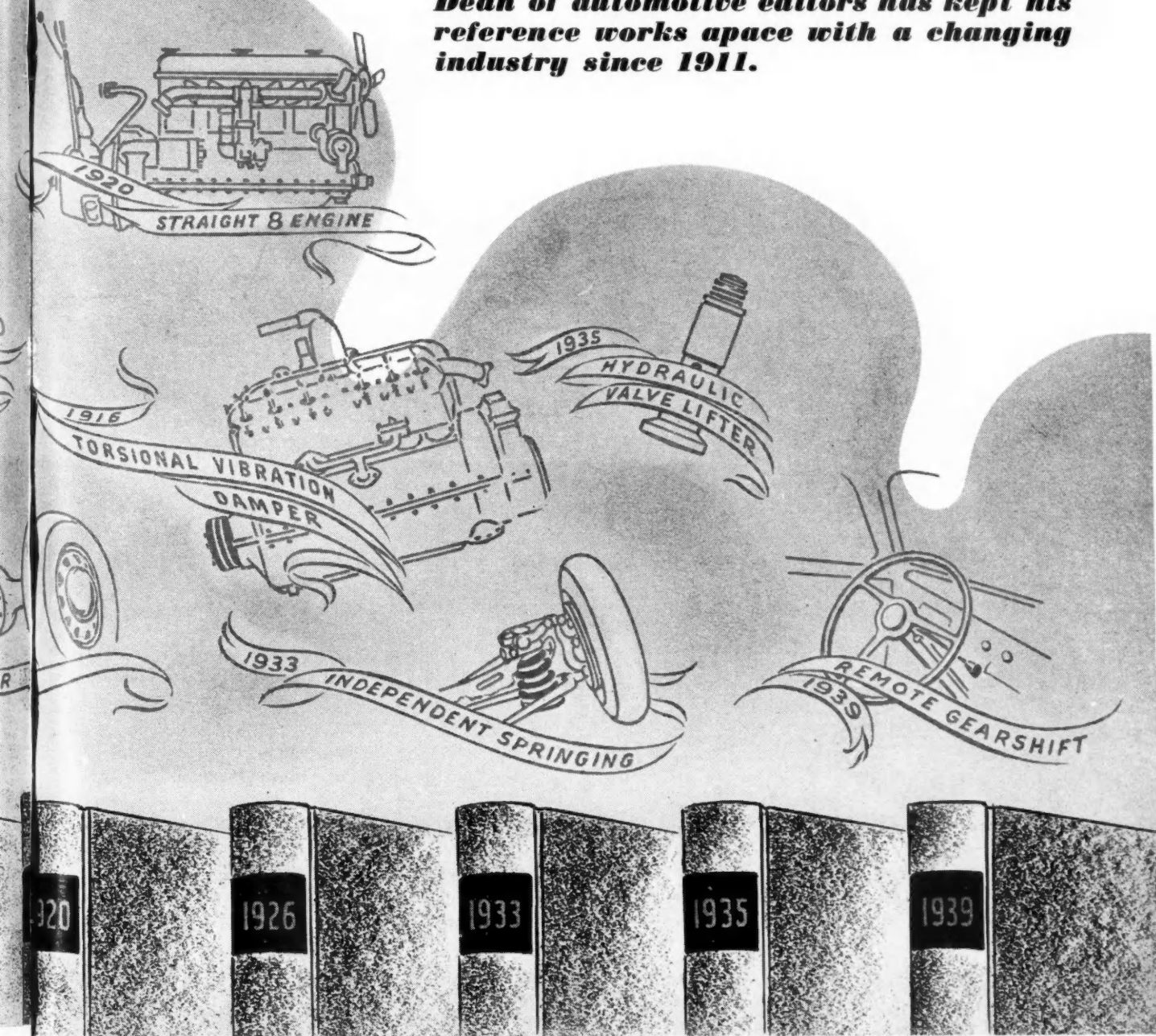
A chapter is devoted to the production of engine blocks, starting with foundry methods, pickling the castings and blast cleaning them, drilling, boring operations and honing. The Profilograph is described in connection with surface finish. Valve seat and guide operations and testing of the block are incorporated. A detailed sequence of machining operations is given for a popular six-cylinder engine. Methods of producing piston rings, their composition, types, wall pressure, methods of finishing and testing are enumerated. The piston pin is

discussed as to loading, size, methods of retaining same in the piston bosses and the connecting rod. Equations are given determining side thrust on the cylinder wall for various crank angles. Piston materials, temperature gradients, skirt design, anodizing and tinning are thoroughly covered. Turning, drilling and grinding operations are illustrated under the manufacturing processes.

Connecting rod materials, proportions, beam strength, pin and big end design and their bearings are analyzed, together with methods of fabrication including inspection. Consideration is given to crank-

(Turn to page 619, please)

Dean of automotive editors has kept his reference works apace with a changing industry since 1911.



Cathode-Ray Engine

CATHODE-RAY engine indicators have gained popularity lately. Their suitability for high speed and the convenience of direct visual observation of the diagram on the screen are valuable features. The connecting passage from the engine to the indicating unit can be made very short, which minimizes gas-column oscillations. Another advantage is that the connection of the recording unit of the instrument to the engine is solely by wires, which is not only convenient, but eliminates the effect of engine vibration on the recording unit.

The schematic setup of a cathode-ray indicating equipment is shown in Fig. 1. The pressure unit and the time sweep unit actuate the vertical and horizontal movement of the cathode ray. Where the cathode ray hits the fluorescent screen, a light spot appears. The beam is deflected by electrostatic fields. The time sweep unit energizes the deflector plates, which displace the cathode ray horizontally, and when acting alone produce a horizontal straight line. The pressure unit energizes the deflector plates which displace the cathode ray vertically, and, acting alone, produces a vertical straight line. When both are connected, the screen displays the time-pressure record. The electric impulses are magnified in the amplifier to actuate the cathode-ray tube. The amplifier and the controls are sometimes built in the same box that holds the cathode-ray tube.

Various methods are being used to convert the pressure fluctuations into electrical impulses suitable for controlling the cathode ray. In the carbon-pile pressure unit the electrical resistance to current flow is changed by compressing the carbon pile. In the piezo-electric type an electric charge is produced on the crystal under the influence of pressure, the potential being roughly proportional to the pressure. In the electromagnetic type of

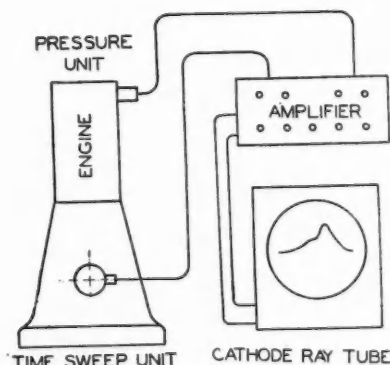


Fig. 1—Schematic arrangement of cathode-ray engine indicator

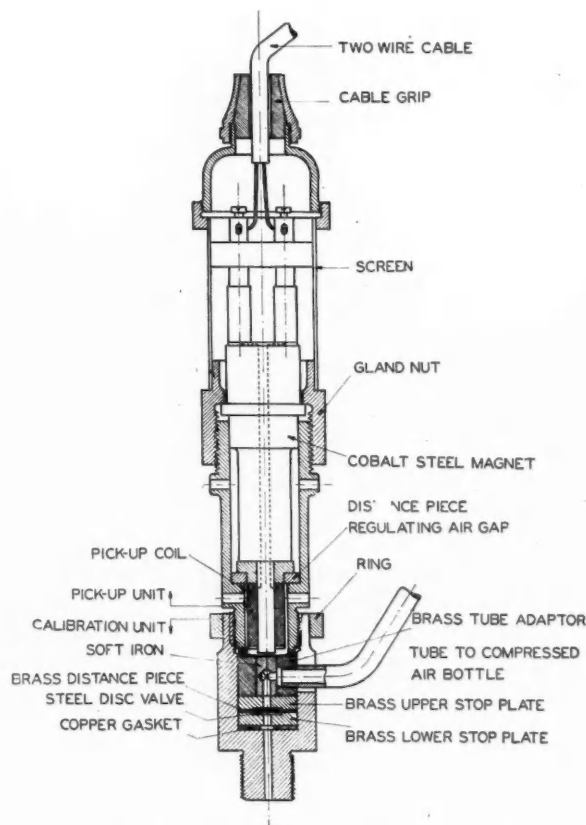


Fig. 2 — Calibration unit for Standard-Sunbury cathode-ray indicator complete

pressure unit the deflection of a diaphragm under pressure varies the gap in the field of a small permanent magnet and produces a fluctuating voltage in the winding of the magnet.

The experience of the Diesel Laboratory of The Pennsylvania State College with the latter two types of cathode-ray indicators was equally satisfactory. For visual comparison a Zeiss-Ikon engine indicator and a Standard-Sunbury cathode-ray engine indicator were both connected to a Diesel engine so that the records could be observed simultaneously. The diagrams appeared very much alike, down to the smallest ripples. Such an observation increases confidence in cathode-ray indicators.

In order to obtain a quantitative check on the record of the Standard-Sunbury indicator, the balanced-pressure method was used. The indicating unit, which was made in our shop following the instructions of the makers, is somewhat similar to that of the Farnboro indicator.

In Fig. 2 a small steel disk of 3/16 in. diameter and 0.020 in. thick is movably mounted between two seats with only 0.002 in. total clearance. A known static air pressure is applied to the upper side, while the lower side of the disk is exposed to the cylinder pressure.

Indicators Have Advantages

Diagrams taken simultaneously on the same Diesel engine by means of two indicators with pressure elements of different type show excellent agreement — A method of calibrating the instruments.

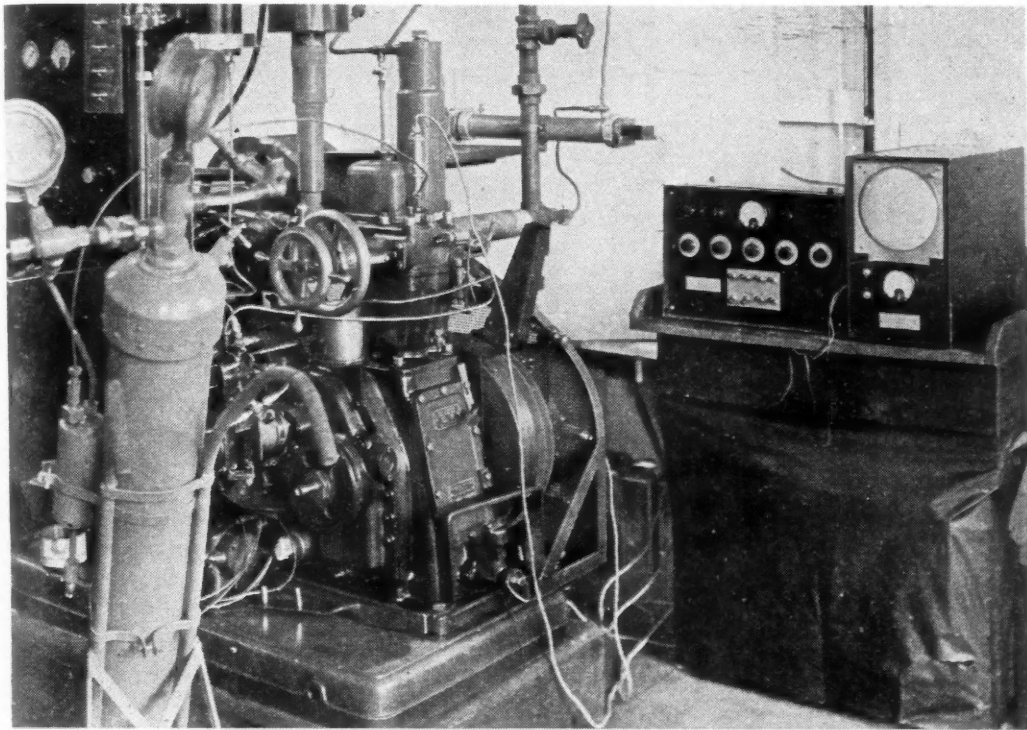


Fig. 4—Calibration of the cathode-ray indicator connected with a C.F.R. Diesel engine

begins, eliminating a delay which is appreciable with high-speed engines. Electric contact points are eliminated. Arcing and pitting of the electric contacts make frequent adjustment necessary, and are very undesirable.

In the calibrating unit a standard Sunbury magnetic pickup was used. This consists of a permanent magnet with a fine coil ending in two terminals. The motion of the steel disk in the field of the magnet generates voltage in

the winding which produces a "kick" on the cathode-ray screen. The disk valve weighs only 0.056 gr. and its acceleration is therefore very rapid.

(Turn to page 621, please)

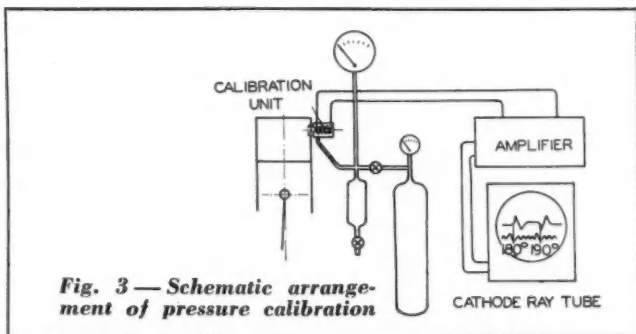
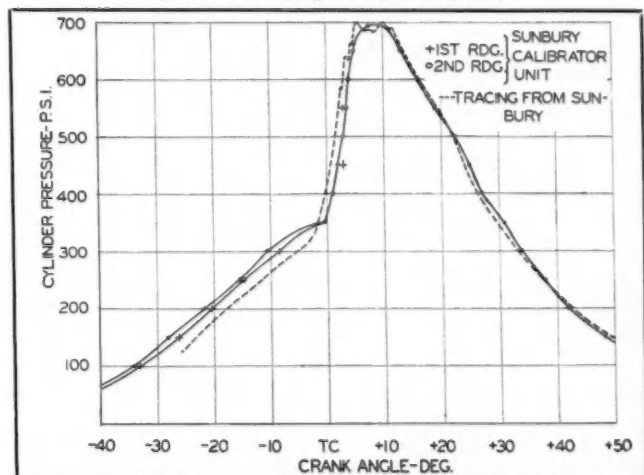


Fig. 3 — Schematic arrangement of pressure calibration

At the moment the cylinder pressure exceeds the balancing pressure, the disk valve lifts sharply and remains on the upper seat as long as the cylinder pressure exceeds the balancing pressure. The moment the disk valve lifts, it is registered in a novel manner. Instead of using an electric contact, the disk, acting as an armature, cuts magnetic lines and generates voltage in a coil wound around the magnet. This offers two distinct advantages. The signal is recorded, not when the movement (0.002 in.) is completed, but when it

Fig. 5 — Calibration of cathode-ray indicator diagram (900 r.p.m.)



Transmission

Hydraulic Devices

SZEKELY COMPANY, INC., of Philadelphia, has developed a number of automotive transmissions in which purely mechanical features are combined with hydraulic devices. One of the simplest is that shown in longitudinal section in Fig. 1. It should be pointed out that all of the drawings accompanying this article are diagrammatic and not actual designs.

At the left in the drawing is shown a flywheel with friction clutch, which is mounted on the engine crankshaft in the usual manner. The driven shaft of the clutch carries the housing of a "fluid flywheel," and this housing in turn connects to the driving pinion of what is essentially a two-speed-and-reverse geared transmission. The pinion meshes with the larger of the two gears forming a spool gear on the secondary shaft, while the smaller of these two gears meshes with a gear on the output shaft, which it drives through an overrunning clutch, the cam member of the overrunning clutch being adapted to slide on splines on the output shaft.

In operation, with the car at a standstill and clutch jaws *A* engaged with jaws *B*, as the flywheel clutch is engaged, the drive is transmitted through the friction clutch, the housing of the fluid flywheel, and the train of low-speed gears in the gearcase. This is the low-gear combination. The runner of the fluid flywheel, being clutched to the output shaft, turns at a lower speed than the impeller, and some power is transmitted through the fluid flywheel as soon as the output shaft begins to turn. The torque which the fluid flywheel is capable of transmitting increases with the speed; when a certain speed is reached, all of the torque required on the propeller shaft is transmitted through the fluid flywheel, and the output shaft of the transmission then overruns the gear carried by it. The car is accelerated further, and when a condition of equilibrium is reached the slip of the fluid flywheel amounts to only a few per cent, so that the drive is virtually direct.

When a hill is encountered and more driving torque is required, the slip of the fluid flywheel increases, and if the hill is so steep that it cannot be negotiated with only crankshaft torque on the propeller shaft, then the reduction gears come into action again automatically, and remain in action as long as more than crankshaft torque is needed to

keep the car in motion and prevent it from stalling.

If the driver sees a long stretch of fairly level road ahead and wants to prevent the slight power loss in the fluid flywheel, he shifts the sliding gear until clutch member *A* engages both members *B* and *C*, which cuts out the fluid flywheel and gives a direct mechanical drive. When a start is made on a smooth, level road or on a slight down grade, power is transmitted through the gears for a very short time only, the output shaft of the transmission overrunning its gear almost immediately.

In order to make it possible to remain in low gear for a considerable length of time (which may be desirable on muddy roads, for instance), the sliding member is so arranged that clutch member *A* can be completely disengaged from both *B* and *C*, as shown in the drawing.

Reverse motion is obtained by shifting the sliding gears to the right until the rear gear is in full mesh with the reversing pinion.

Fig. 2 shows a semi-automatic, hydraulically controlled transmission. It also is used in combination with the usual friction clutch in the engine flywheel.

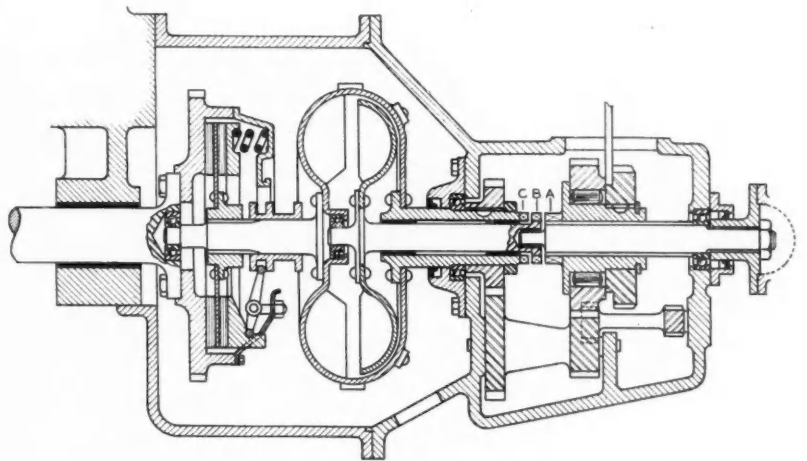


Fig. 1—Szekeley transmission of the simpler type with friction clutch and fluid flywheel.

part of the housing for which is shown at the left. The interior of the transmission housing is divided into three compartments. In the compartment at the left there is a bevel-type differential gear which is driven through its housing. The housing, of course,

Designs Combine with Mechanical Drives

is in driving connection with the spider carrying the differential bevel pinions, and the hub of this spider drives the center shaft through an overrunning clutch. This center shaft has one side gear of the differential rigidly secured to it, while the other is adapted to turn freely upon it.

At the right in the central compartment of the housing there is a planetary gear train of the internal-gear type, the sun gear *C* of which is splined to the center shaft. Internal gear *G* of this train is keyed in a circumferential flange on the pump housing, and both internal gear and pump housing are held from rotating backward by means of a roller ratchet in the small compartment of the gear housing at the right. Therefore, if the center-shaft turns right-handedly, the planetary spider *D* also will turn right-handedly, but at a speed only about one-third as high. Spider *D* is connected to the output shaft through the positive clutch *E*.

The low speed forward is thus through the differential gear at the left (without differential action), then through the center and through the planetary gear train at the right in the center compartment. This gives a low-speed reduction of, say, 3:1. While the low forward gear is in operation, both side gears of the differential rotate at the same speed as the housing of the differential and the center shaft. If now the rear (or right-hand) side gear of the differential is held from rotation by suitable means, then the center shaft of the differential will be turned at twice the speed of the differential housing, and, therefore, at twice crankshaft speed. The planetary gear train in the center compartment still giving a reduction of about 3:1, the reduction from the crankshaft to the output shaft is now 1.5:1, and this is the intermediate speed. Locking of the rear side gear of the differential is effected by means of a gear-type pump on the ring gear, hence there will be no right-hand rotation and the center gear of the pump will remain stationary (pump *A*). Owing to the fact that internal gear *G* is keyed in a flange on it, the housing of this pump is held from turning backward (left-handedly) by the roller ratchet in the rear compartment of the transmission housing. The pump consists of a central gear splined to the hub of the rear differential side gear, which meshes with a

number of smaller pinions that are a snug fit in bores of the pump housing. When there is no oil in the pump, the gear and pinions can turn freely around their respective axes, and this they do when the friction clutch is first engaged and the car is set in motion.

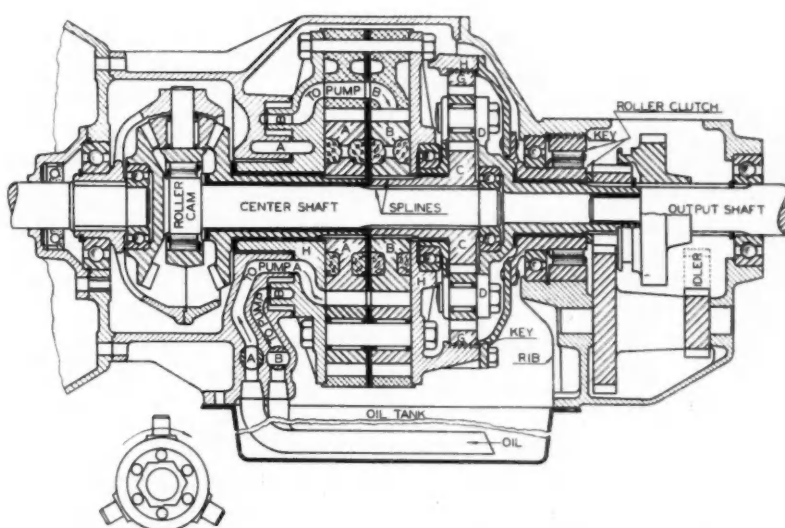


Fig. 2—Semi-automatic hydraulically controlled transmission

However, the valve *A*, which admits oil to pump *A*, is normally open, and immediately the pump gears begin to rotate, oil is drawn into the pump housing. On the pressure (or delivery) side of the pump housing, instead of the usual free delivery port, there is a spring-loaded relief valve, which will open and let oil pass when the pressure rises beyond a certain predetermined value. The primary object of this valve is to prevent shock to the system on starting and in the event of high engine acceleration. In normal operation this relief valve remains closed.

Therefore, shortly after the friction clutch is engaged, the pump will be filled with oil and will then lock. The torque of the center gear now tends to turn the pump housing right-handedly, but as this is only one-half the engine torque, it is not equal to the left-hand torque which locks the assembly against the roller ratchet, and the pump, therefore, remains stationary.

To engage the high speed or direct drive, oil is admitted to pump *B* through valve *B*, which is con-

trolled by a small lever on the steering column. When both pumps *A* and *B* are locked, the whole of the engine torque is impressed on the pump housing, and the latter then rotates with the center shaft. The planetary gear is locked and the drive is then from the clutch shaft to the center shaft through the differ-

ential gear (without differential action) and from the center shaft to the output shaft through the planetary gear assembly (without planetary action). In other words, the drive is direct.

A reversing gear is provided in the small compartment of the transmission housing on the right-hand side.

A transmission embodying an overdrive is shown in Fig. 3. The principles involved are generally the same as those on which the transmission shown in Fig. 2 is based. At the right in the center compartment there is the same planetary gear train for low speed. In low gear the drive is through the locked differential gears, the center shaft, and the plane-

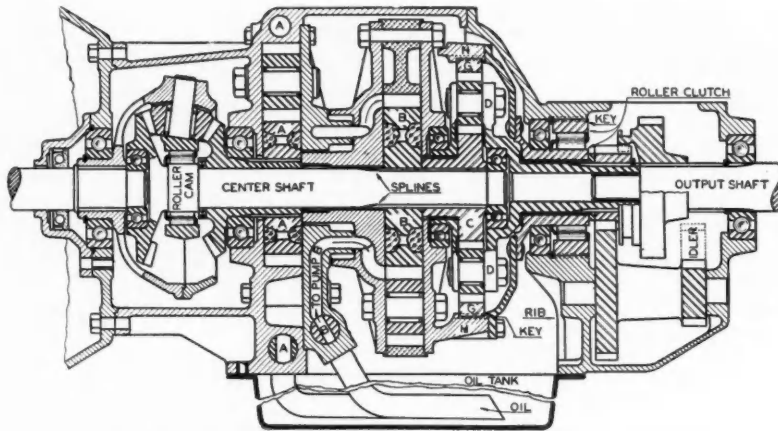


Fig. 3—Szekey Transmission embodying an overdrive

tary gears. Pump *A* to the left, is driven through the smaller of the two side gears of the differential. As soon as the pump is filled with oil, the pump - and-bevel - gear unit stops, and a large side gear, which is secured to the center shaft, will then turn at between one and two times engine speed, the exact ratio being

one plus the ratio of teeth in the smaller to that in the larger side gear. For instance, if the reduction in the planetary train is 3:1, the reduction ratio in second gear can be readily made 2:1, which requires a multiplication ratio of 1.5 in the differential gear.

To go into direct drive, pump *A* must be disconnected and pump *B* charged. The latter then will carry its own housing and cause the internal gear *G* to rotate at engine speed. The center gear of pump *A* and the small side gear connected to it will carry no load; they will merely float on the center shaft and, therefore, rotate with it at engine speed. All of the other gears of the differential also will be without load.

PRODUCTION LINES — (Continued from page 606)

Off-the-record, we understand that the automotive industrial power plant can pay for itself within a short time under these circumstances. Multiply Detroit by the many other communities, large and small, and it all adds up to good business for the independent commercial engine builders.

By Eye

Prominent piston ring manufacturer tells us that they have developed a unique method of checking, visually, the form of the ring. While the technique is proprietary, we believe that it might be made available to inspection departments of engine and motor car plants. Certainly, a simple way of assuring quality will be welcomed by inspection executives.

Craftsmanship

In this day of mechanization we find pleasure in observing the craftsmanship embodied in the product of the high-grade drop forging establishment. Recently we visited a plant in Lansing, an organization well known wherever forgings of high character are used. In the background are the scientific controls of the

steel, forging temperatures, heat treatment. But most impressive to those who appreciate good workmanship is the skill, the consummate touch of the master hand at the forges. Here is an outstanding example of the transference of an artisan's skill, one of the few places in modern industry where the machine contributes only its power. And the indications are that this art, improved by modern scientific aids, will persist long into the future.

Metals Rated

After considerable study, a subcommittee of the Independent Research Committee on Cutting Fluids has prepared a table rating steels, irons, non-ferrous materials according to ease of metal cutting. Final table is a compromise cross-section of a number of machinability rating tables published recently. Very shortly another subcommittee will round out the machinability rating table by including recommended cutting fluids for each type of metal providing a range of cutting fluids suitable for differing metal removal operations. This report will be unique in the literature on metal cutting and should constitute an invaluable source of recommended practice.

Bendix-Westinghouse Develops Automatic Clutch Control

CHIEFLY for use on vehicles where the operator is located at a considerable distance from the clutch, the Bendix-Westinghouse organization has developed an automatic air clutch control. It consists of an air cylinder with direct mechanical connection to the clutch throw-out lever. This air cylinder disengages the clutch when it is supplied with sufficient air pressure, the pressure being provided from the air-brake system through an air valve, which in turn is controlled by a centrifugal governor driven by the engine. This valve, described as a centrifugal valve, supplies sufficient pressure to the air cylinder to hold the clutch released, at idling speed, and decreases this pressure in direct proportion to the engine speed. In view of this, when a vehicle is at a standstill, the operator may select first or reverse gear while the engine is idling, and these gears, therefore, are pre-selective.

When ready to start the vehicle, the operator accelerates the engine, thereby reducing the pressure in the clutch cylinder and permitting the clutch to engage. The engagement is said to be exceptionally smooth, because the pressure reduction is in direct proportion to engine acceleration, and if the clutch should take hold too rapidly, it would result in slowing down of the engine, an automatic increase in the air pressure in the cylinder, and a partial retraction of the clutch.

Full engagement results when the speed of the engine is equal to that of the drive shaft. Air pressure in the cylinder drops to atmospheric when the engine speed reaches 1000 r.p.m. To shift from first to second speed, the operator releases the accelerator pedal and then makes the shift in the conventional way. The initial part of the motion, into neutral, operates another valve known as the clutch valve, which supplies air pressure to the clutch cylinder to completely release the clutch for shifting. Operation of this valve is completely independent of the centrifugal valve. This clutch valve permits simplified double-clutching where required. If the driver hesitates while the shift lever is in the neutral position, the clutch valve relieves the pressure in the clutch cylinder, causing the clutch to engage. By now shifting from neutral to second, the driver again actuates the clutch valve, this time to disengage the clutch during the shift and re-engage it at the end of the shift. Since the exhaust of the clutch

valve is directly controlled by the centrifugal valve, smooth clutch engagement is again assured. Shifting from second to third is accomplished in the same way.

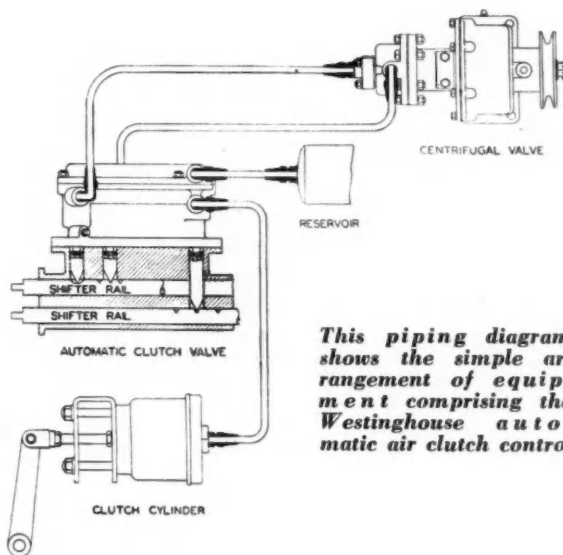
It will thus be seen that the centrifugal valve completely dominates clutch engagement in first speed and reverse only, since the cut-out valve discontinues the air supply to the centrifugal valve when running in second or third speed. This precludes mis-using the clutch by starting in too high a gear for the conditions. It also permits the use of the engine as a brake, since the engine would stall unless a manual shift into low gear were made before the car comes to a standstill.

When desired, the new automatic air clutch control permits of shifting from third to second or from second to first without clashing of gears. All that is necessary is to hesitate slightly in neutral when making the shift. With the transmission in either low gear forward or reverse it is impossible to stall the engine. To prevent excessive clutch slippage in case of too great a torque load, an additional valve referred to as the centrifugal valve cut-out is provided. This valve, which is actuated by a slight additional movement of the ac-

celerator pedal after the throttle has been fully opened, severs communication between the clutch cylinder and the centrifugal valve and reduces the air pressure in the clutch cylinder to atmospheric, thereby fully engaging the clutch.

As to the advantages of this new system of clutch control, it is claimed that it:

1. Increases passenger comfort, inasmuch as it assures consistently smooth clutch engagement, thus minimizing possible effects of operator's inexperience, carelessness or rough handling when engaging the clutch.
2. Accelerates schedules, as the first gear can be pre-selected during loading periods. Also, shifting is easier and quicker, from power off in one gear to power on in the next gear, due to the automatic action.
3. Driver fatigue is reduced by the elimination of physical operation of the clutch pedal and mental effort required for timing the clutch action.
4. Maintenance costs are reduced, since clutch facing, pressure plate and flywheel life will be greatly increased due to the elimination of unnecessary clutch slippage. Transmission and drive units will last longer.



This piping diagram shows the simple arrangement of equipment comprising the Westinghouse automatic air clutch control

New Process

for the production of aviation gasoline

THE Houdry process for treating petroleum hydrocarbons catalytically was described in a paper by Eugene Houdry, Wilbur F. Burt, A. E. Pew, Jr., and W. E. Peters, Jr., read before the American Petroleum Institute at its recent annual meeting. The process can be worked in various ways and with somewhat different objects in view, but its most important application seems to be in the cracking of crudes and fractions or residues thereof.

Fig. 1 is a flow sheet showing the general steps used in processing a crude oil running to fuel oil, with one pass through the catalyst, and with the removal of straight-run products optional. The dotted line indicates the flow if desired to run to "no residuum." As shown in the diagram, crude oil is pumped through heat exchangers, wherein it is preheated by the products from the catalytic cases; thence to a primary flash fractionating tower, wherein the desired straight-run products are fractionated and removed. The residue from the flash tower is pumped through a still, heated to approximately 880 deg. Fahr.—depending on stock—thence into a vaporizer. Tar bottoms are removed as a liquid, and the vaporized fractions of the charge pass to the catalyst chambers. From the catalyst chambers the vapors pass through the crude-oil exchanger into the final fractionating tower, wherein gasoline, furnace oil, and heavy gas oil are separated—the latter two being combined, if desired, for recharge to catalytic- or thermal-cracking operations. If gas oil is charged, the flash tower and the vaporizer are eliminated—the charge being pumped through exchangers to the still, and thence direct to the catalyst. If a residue is to be charged, the primary flash fractionating tower is eliminated—the charge passing direct to the still, and thence to the vaporizer for tar separation. To eliminate fuel production, the charge from the still is charged to a vaporizer—wherein, through a special catalytic mass, the entire charge is vaporized and passed to the catalyst. In special cases it is advisable to charge the entire crude to the catalyst without removal of straight-run products. The flow arrangement for this operation is the same as described for residues. Many variations in flow are possible, but the above are the principal ones.

In general, the yield of gasoline will be about 45 per cent, based on charge to catalyst, from a single-pass operation on any stock, whether gas oil or residue. The octane number of the gasoline produced from any charged stock heavier than gasoline is from 77 to 81 for 437-EP gasoline. Octane numbers by the research method will run 7 to 10 points above these figures. The octane value does not change to any appreciable extent, with boiling points, and these values are obtained regardless of type of crude. Lead

susceptibilities and blending values are high. The blending value of Houdry with straight-run gasoline is usually 4 to 10 points higher than the actual octane number. Unless otherwise noted, all references to octane value are on the basis of ASTM motor-method rating.

Catalytically produced gas oils again can be cracked by the catalytic operation; and the yield, while lower than obtained on virgin gas oil, is higher, pass by pass, than usually is obtained in a thermal unit. Catalytically produced gas oils make excellent charging stocks for thermal units. Tests indicate that yields by thermal cracking of gas oils produced by one-pass catalytic conversion will be at least as high as those shown in Table 1. Octane numbers on the gasoline produced will be somewhat higher than on gasolines produced by thermal crack-

ing of similar virgin gas oils.

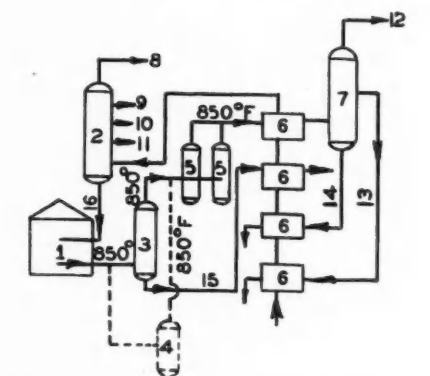


Fig. 1—General flow diagram showing combination crude-tapping and catalytic-cracking process.

1. Still
2. Primary flash and fractionating tower 5 lb. gage
3. Vaporizer 20 lb. gage
4. Catalytic vaporizer
5. Catalyst cases
6. Heat exchangers
7. Synthetic crude fractionating tower 10 lb. gage
8. Light gasoline
9. Naphtha
10. Kerosene
11. Gas oil
12. Gasoline-gas
13. Furnace oil
14. Heavy gas oil
15. Tar bottoms

TABLE I
Yield by Thermal Cracking of Houdry Gas Oil

Gravity of Catalytic Gas Oil (Deg. API)	Thermal Gasoline Yields (Per Cent)	8-Deg.-API Fuel (Per Cent)
20	50	38
27	54	34
31	58	30

An outstanding feature of these catalytic operations is their ability to produce aviation gasoline. It is believed by the authors that the manufacture of aviation gasoline by this process (7,000,000 gal. in 1937-1938) represents the first commercial application of a synthetic process for aviation-fuel production. This does not refer to synthetic anti-knock components such as isooctane and isopropyl ether; as such materials are

(Turn to page 623, please)

Heldt's "High Speed Combustion Engine"

(Continued from page 611)

shaft materials and heat treatment, number of main bearings, design for different cylinder arrangements, counterweighting, proportions as indicated by current practice, forged versus cast shafts, ball-bearing mounting, location of oil ducts and the flywheel with its necessary capacity and mounting. Methods of fabrication include various balancing methods. Bearing loads on the piston-pin, crank-pin and main bearings are determined from gas pressure diagrams, centrifugal and inertia forces, together with the effects of crank throw spacing and counterweighting. Apart from methods of calculating these forces, the chapter is well illustrated.

Under torsional vibration and dampers, a study is made of harmonics and critical speeds together with the influence of explosion sequence. Torsiograph diagrams, vibration dampers of different types, crankshaft stiffness, deflection and moments of inertia of the crank-pin, crank-arms, journal and the flywheel are comprehensively covered.

Due to its practically universal use, the poppet valve is solely dealt with and consideration is given to seat forms, operating temperatures, head design and cooling including the use of sodium. Volumetric efficiency and timing are discussed and the latest methods of manufacture illustrated. The upset head developed from a rod forming the stem provides rapid, economical production. The valve actuating mechanism covers the various types of cam contours for mushroom and roller type followers and a thorough analysis compares the merits of cams of the tangential, constant acceleration and the mushroom follower types as effecting lift, speed and acceleration. Tappet developments are brought up to date with the inclusion of the "zero-clearance" type. Valve springs are considered from the point of view of load requirements, materials, their retention on the valve stem, spring surge and dampers for the latter. Direct actuation and the use of rocker levers for overhead valves complete the study. The camshaft is considered from the dimensional point of view, cam loading, bearings, materials and the necessary machining and grinding production methods. Various types of gear and chain camshaft drives include methods of manual and automatic adjustments for tensioning the latter. Fan and accessory belt drives, accessory couplings and methods of driving the distributor and oil pump are described and shown.

The chemical composition of gasoline, density measurements, distillation curves, heat value and vapor pressure precede the discussion on vapor lock, ease of starting and anti-knock ratings. The new chapter on carburetors covers mixture proportioning and various means for its compensation over the entire range. The various elements in carburetor design are well illustrated from current units. Economizer valves, the automatic choke, dual carburetors and the fuel pump round out the fuel supply system. The section on ignition equipment is also new, covering both magneto and battery systems. Automatic and vacuum control of the distributor and their effect on engine output and

economy are discussed. Spark plug types, materials, temperature range and length of gap are considered.

Bearings are brought up to the minute with the discussion on babbitt, copper lead, cadmium, indium and Satco metal bearings. Different types and the functioning of lubricating systems are completely covered as well as their component parts such as the oil pump, cold starting requirements, grooving of the bearing, oil jet and pressure feed to the cylinder walls, oil manifolds versus drilled galleries in the crankcase, oil gauges, breathers, fillers, coolers, filters and crankcase ventilation.

Under water cooling, the various types of radiator cores are disclosed, together with their detailed construction and heat dissipating ability. Fan and water pump constructions, separate and combined units, are illustrated and their efficiencies, power consumption and design details indicated. Thermostats of the stop-circulation, by-pass and radiator shutter control types are illustrated as is the filler cap vent valve for raising the normal boiling point of the cooling water. Air cooling covers fin design, heat dissipation therefrom, blower cooling and cooling air requirements.

Mixture distribution in the intake manifold, exhaust heat hot-spot control, port design and firing sequence are considered in relation to both manifolds. Various types of mufflers are illustrated, including the "straight-through" design. Gas inertia, centrifugal and hydraulic governors show the various engine speed control devices.

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The various types of equipment enumerated under Engine Tests include the DeJuhasz sampling valve, the Farnsboro indicator, carbon stack electrical indicators, piezo-electric units and the cathode ray tube. Electric and hydraulic dynamometers are described. In the appendix the tolerances on representative engine parts are given as well as a table on the primary and secondary shaking forces and rocking couples based on various crank and cylinder arrangements.

The student will be particularly interested in the basic considerations and formulas throughout the book. Besides this, the designer will find countless illustrations showing current practice on detailed structure and which is supplemented in the back of the book by cross sections of representative engines used throughout the world, ranging from the diminutive four cylinder Fiat "Balilla" to the latest Mack "Thermodyne" power plant.

New Process

for the production of aviation gasoline

THE Houdry process for treating petroleum hydrocarbons catalytically was described in a paper by Eugene Houdry, Wilbur F. Burt, A. E. Pew, Jr., and W. E. Peters, Jr., read before the American Petroleum Institute at its recent annual meeting. The process can be worked in various ways and with somewhat different objects in view, but its most important application seems to be in the cracking of crudes and fractions or residues thereof.

Fig. 1 is a flow sheet showing the general steps used in processing a crude oil running to fuel oil, with one pass through the catalyst, and with the removal of straight-run products optional. The dotted line indicates the flow if desired to run to "no residuum." As shown in the diagram, crude oil is pumped through heat exchangers, wherein it is preheated by the products from the catalytic cases; thence to a primary flash fractionating tower, wherein the desired straight-run products are fractionated and removed. The residue from the flash tower is pumped through a still, heated to approximately 880 deg. Fahr.—depending on stock—thence into a vaporizer. Tar bottoms are removed as a liquid, and the vaporized fractions of the charge pass to the catalyst chambers. From the catalyst chambers the vapors pass through the crude-oil exchanger into the final fractionating tower, wherein gasoline, furnace oil, and heavy gas oil are separated—the latter two being combined, if desired, for recharge to catalytic- or thermal-cracking operations. If gas oil is charged, the flash tower and the vaporizer are eliminated—the charge being pumped through exchangers to the still, and thence direct to the catalyst. If a residue is to be charged, the primary flash fractionating tower is eliminated—the charge passing direct to the still, and thence to the vaporizer for tar separation. To eliminate fuel production, the charge from the still is charged to a vaporizer—wherein, through a special catalytic mass, the entire charge is vaporized and passed to the catalyst. In special cases it is advisable to charge the entire crude to the catalyst without removal of straight-run products. The flow arrangement for this operation is the same as described for residues. Many variations in flow are possible, but the above are the principal ones.

In general, the yield of gasoline will be about 45 per cent, based on charge to catalyst, from a single-pass operation on any stock, whether gas oil or residue. The octane number of the gasoline produced from any charged stock heavier than gasoline is from 77 to 81 for 437-EP gasoline. Octane numbers by the research method will run 7 to 10 points above these figures. The octane value does not change to any appreciable extent, with boiling points, and these values are obtained regardless of type of crude. Lead susceptibilities and blending values are high. The blending value of Houdry with straight-run gasoline is usually 4 to 10 points higher than the actual octane number. Unless otherwise noted, all references to octane value are on the basis of ASTM motor-method rating.

Catalytically produced gas oils again can be cracked by the catalytic operation; and the yield, while lower than obtained on virgin gas oil, is higher, pass by pass, than usually is obtained in a thermal unit. Catalytically produced gas oils make excellent charging stocks for thermal units. Tests indicate that yields by thermal cracking of gas oils produced by one-pass catalytic conversion will be at least as high as those shown in Table 1. Octane numbers on the gasoline produced will be somewhat higher than on gasolines produced by thermal crack-

ing of similar virgin gas oils.

Fig. 1—General flow diagram showing combination crude-tapping and catalytic-cracking process.

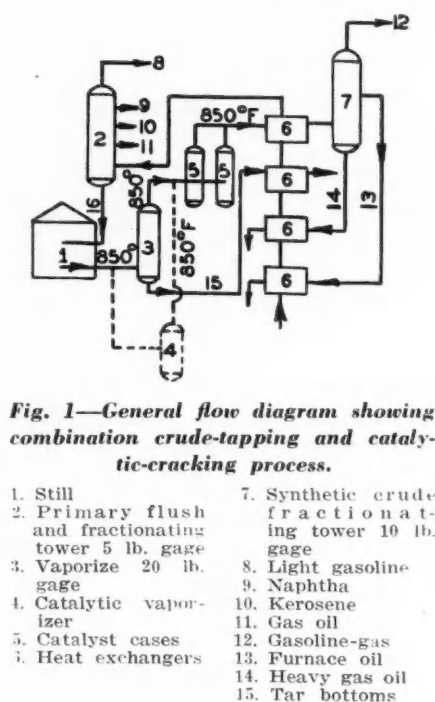


TABLE I
Yield by Thermal Cracking of Houdry Gas Oil

Gravity of Catalytic Gas Oil (Deg. API)	Thermal Gasoline Yields (Per Cent)	8-Deg.-API Fuel (Per Cent)
20	50	38
27	54	34
31	58	30

An outstanding feature of these catalytic operations is their ability to produce aviation gasoline. It is believed by the authors that the manufacture of aviation gasoline by this process (7,000,000 gal. in 1937-1938) represents the first commercial application of a synthetic process for aviation-fuel production. This does not refer to synthetic anti-knock components such as isooctane and isopropyl ether; as such materials are

(Turn to page 623, please)

Heldt's "High Speed Combustion Engine"

(Continued from page 611)

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It's Control all along the Line

(Continued from page 602)

provides soundproofing and aids in insulating the cabin against low outside temperatures. A large felt producer suggests that it would frequently be advantageous to line the cabins with a composite panel composed of a layer of $\frac{1}{8}$ in. felt, then a sheet of $\frac{1}{16}$ in. of spruce plywood, and on top of these a final layer of felt $\frac{1}{32}$ in. in thickness, these layers being made into one piece by gluing one to the other. All wool black felt covered rubber channels are recommended for lining window frames against vibration and to provide weather insulation. Felt also may be used for this purpose around other openings such as doors, access plates, inspection holes, etc.

One large felt company which has been particularly active in pushing research to improve the quality and uniformity of its product has developed a convenient method of determining density of a piece of felt. A formula has been developed as follows:

Percentage Density = $100 \times \text{Specific Gravity (S. G. of water = 1.00)}$

$$= 100 \times \frac{W \times 453.6}{T \times 1296 \times 16.3871}$$

$$= 2.136 \times \frac{W}{T}$$

Where W = Weight of felt in pounds per sq. yd.; T = Thickness of felt in inches—determined by 1 sq. in. presser foot under 10 oz. load; 453.6 = conversion factor lb. to gm.; 1296 = Conversion factor sq. yd. to sq. in.; 16.3871 = Weight in gm. of 1 cu. in. of water.

It is pointed out that this expression may be applied to density determination of felt in sheet or roll form, but inasmuch as such density control would be especially valuable for cut parts, this expression can be modified as follows:

$$\text{Percentage Density} = 100 \times \frac{W}{T \times A \times 16.3871}$$

Where: W = Weight in gm. of 10 cut parts; T = Thickness in in.—determined by 1 sq. in. area presser foot under 10 oz. load using the ASTM Method of Cut Parts Nesting; A = 10 times the face area of the part in sq. in.; 16.3871 = Weight in gm. of 1 cu. in. of water.

Substitution in the general expression given makes possible the easy determination of the density of any felt of specific weight and thickness. Cut parts density as determined by the modified expression, states this producer, "should be within the tolerance for the material from which the parts were cut." The evolution of this expression is typical of the work carried on by felt makers in the hope that designers and engineers will be "better able to intelligently select the proper felt for their various problems."

This same company has compiled some very inter-

esting data on the adhesives now available for affixing felt to various materials. From careful research involving the investigation of a wide variety of materials commercially available, the table reproduced herewith has been evolved. It is stressed that the character of the application in some cases should "govern the choice of adhesive." In other words, if a certain felt assembly will be exposed to a solvent used in the adhesive, that material must not be used.

An especially interesting development in affixing felt to metal is a process which uses an alloy of lead and tin, known to the trade as terne alloy, for the bonding element. The coated metal is heated to a temperature at which the first metal coating becomes liquid, and while the coating is still in the liquid form the felt is rolled onto the metal sheet. The rolling operation forces the liquid metal into the pores of the fibrous felt in such a way that the felt, in a sense, becomes part of the metal. A final cooling operation solidifies the liquid metal so rapidly that charring of the felt is avoided.

There are a number of advantages claimed for this method as compared with other means available for attaching felt to metal. A change in moisture, for instance, is said to have no effect on the union between the felt and the metal. Heat change, up to the temperature at which the felt will char, has no detrimental action on the bond. The bond is of a plastic nature so that the composite felt and metal material may be formed by drawing, bending, etc., up to the point where the metal itself fails.

Valuable Combinations

Such combinations of felt may be found of value wherever there is a need either to reinforce felt or attach it to other materials. Likewise, in attaching material other than felt to metal, it has been found that a thin layer of felt attached to metal by this process affords an excellent base for the application of other adhesives.

Another interesting development is the use of felt in combination with Neoprene. The type most ordinarily used consists of two layers of felt with a center insertion of Neoprene. However, parts have been made with Neoprene on both exterior surfaces, with a center layer of Neoprene and on one exterior surface, and other such combinations can be effected. The manufacturer of this product emphasizes its excellent oil resisting properties.

While on the subject of the use of felt in combination with other materials mention should be made of a product recently introduced which consists of wood veneer bonded to hair felt. It can be cemented direct to practically any surface, such as steel, wood, cement, wall board, plaster board, etc. In addition to being flexible and resilient, this product is said to provide a considerable degree of insulation against outside temperatures, reduce sound vibration in walls and absorb

room noises to an appreciable degree. A well-known American automobile manufacturer adapted this material to one model in its 1939 line.

Among the various problems encountered in the use of felt in the automotive, or any other industry, it has been found that felt subjected to high compression pressures sometimes breaks down and its desirable properties are destroyed. Bolt loadings, for instance, may be tremendous and quite often exert a much greater force than the type of felt selected will withstand. From numerous laboratory experiments, a prominent felt manufacturer has evolved several charts which give the deflection in inches of various types of felt under known loadings. For example, felt is wanted that will deflect to a given thickness under a certain loading. It can be readily determined by referring to the chart for firm material that $\frac{1}{2}$ -in. nominal thickness of felt is compressed to 0.25 under loadings of 50 lb. per sq. in.

Standardization has been and continues to be of vital importance in the production of maximum felt quality. A table appended herewith combines present SAE specifications of chemical and physical properties for felts along with several elements of standardization proposed by a large felt maker.

Color of a felt is generally a good indicator of the quality of the wool used in its manufacture. White felts are usually a product of the high-grade new raw stock. Other grades are frequently grey or tan and sometimes pink, brown or black. Clear colors obtained by dyeing are usually of new material, whereas greys and blacks may contain an amount of wool that has been reworked.

Large quantities of felt are used as wicking, and for this application it is recommended that a neutralized felt be used so that corrosion of adjacent metal parts and fiber deterioration at elevated temperatures will be prevented. Further, it is also desirable that felts having a low residual ash content be used, and in order to prevent fibers clogging the lubricating point, a good grade of felt, having medium to long fibers, should be employed. A graph reproduced herewith indicates the absorption of oils by SAE felts. Typical applications of felt with lubricants include, in addition to wicks, the use of washers which may be saturated with oil and sealed within bearing assemblies. The use of wicking, when saturated with oil and inserted into coiled springs as a rust preventive, has proved valuable in addition to the more common applications, wherein a short length, drilled from a long piece, or punched from a sheet, is saturated and enclosed in a housing adjacent to a bearing as in an electric motor, or in connecting an oil reservoir, through a drilled housing or tube, with a remote bearing point. In addition to acting as an oil feeder or reservoir, felt may be impregnated with oil, water pick-up agents, glycerine or grease dispersions of colloidal graphite, with tallow or with various hardnesses of wax to provide an auto-lubricating part for a variety of mechanical movements."

In conclusion, the desirable properties of felt, briefly, are as follows: almost perfect resiliency; ability to exclude dust and all extraneous matter; will hold oil and

grease; has low friction against metal; is highly flexible; deadens sound; dampens vibrations; is excellent thermal insulation; has high tensile and tear strength; is an excellent polishing agent; and makes a highly efficient filter.

The importance of felt in the automobile, and vice versa—the importance of the automotive industry to the felt manufacturers—is emphasized by the following figures. In 1938 the felt manufacturers produced about 15,000,000 lb. of wool felt. Of this quantity, 25 per cent or \$2,250,000 was absorbed by automobile, truck and tractor manufacturers.

Cathode-Ray Engine Indicators

(Continued from page 613)

The procedure for determining the cylinder pressures was as follows. An air bottle filled to 1000 lb. per sq. in. pressure was connected to the calibrating unit, which in turn was wired through the amplifier to the cathode-ray tube (see Fig. 3). Since the maximum combustion pressure in the cylinder was lower than 1000 lb. per sq. in., the cathode-ray image was a straight line. The air pressure was then successively lowered until a "kick" appeared on the line, as shown in Fig. 3. The air pressure at which the first kick was observed was put down as the maximum pressure. To determine its location, a degree scale was thrown on the screen by turning a switch. This is obtained from the Sunbury sweep unit, which contains a slotted steel disk with 180 slots and an electromagnetic pickup which produces a sine line on the screen on which each wave corresponds to 2 deg. crank angle. The dead-center point and 10 deg. divisions are marked by taller waves, corresponding to deeper slots. In this way, both the location and the magnitude of the maximum pressure were recorded. Then the air pressure was lowered in stages of 50 lb. per sq. in., and every time the location of the kicks determined by the degree scale. Except for the maximum pressure, two kicks are recorded at every pressure, because the diaphragm moves up when the cylinder pressure exceeds the balancing pressure, and then moves down when, during the expansion period, the cylinder pressure drops below the balancing pressure. In this manner the pressure is reduced to atmospheric, and 2 deg. readings are obtained for each pressure reading.

Fig. 4 shows the setup and Fig. 5 is a record obtained. Two sets of readings were taken with the calibrating unit and they agree remarkably well. The dash line is the tracing of the indicator diagram as obtained with a Standard-Sunbury pickup unit, re-plotted to a scale that gives 700 lb. per sq. in. maximum pressure. The agreement between the traced indicator diagram and the "true" diagram obtained by the point-to-point method is very satisfactory.

The conclusion is that the records obtained by a cathode-ray indicator are dependable if the pressure calibration is dependable, and the latter can be made accurately with the balanced-pressure calibrating unit in a relatively simple manner.

The experiments here reported were made in June, 1938, by Dr. J. S. Chandler in The Pennsylvania State College Diesel Laboratory.

Men and Machines . . .

(Continued from page 606)

The table width is 10 in. and the table is provided with three T slots having a 2 5/16 in. spacing. This arrangement, plus the long quill adjustment of 2 3/8 in., gives increased flexibility of fixture design and permits the work to be brought close to the column.

For climb milling operations, a hydraulic backlast eliminator is provided.

Colonial Broach Co., Detroit, has a new line of "Junior" broaching and assembly presses. Measuring only 31 in. in overall height, the "Juniors" have a capacity rating of 1/2 ton, with stroke adjustable up to 10 in. They are so designed that they may be mounted on standard benches, having a base area of only 12 by 22 in.

The Juniors may also be mounted as accessories directly on such machine tools as lathes, etc., for pressing on and removing parts from arbors. Vertical mounting of the 1 hp. motor within the machine provides the Junior with clean streamlined appearance and is of further advantage in locating the presses in limited space.

Design features include: Built-in oil tank with sight gage and 1000 lb. pressure hydraulic pump, with sight gage for reservoir; completely enclosed 1200 r.p.m. direct drive motor; standard Colonial power-cylinder construction and single hand-lever operating control; stroke adjustable by means of sliding collars; 5-in. clearance between ram and machine frame; 8 by 12 in. platen, and rugged frame for maximum work accuracy.

A single disc coil stock cradle designed to handle a 3 1/2-ton coil, 52 in. outside diameter by 20 in. wide as a maximum, is illustrated herewith. It is made by the Cleveland Punch and Shear Works Co.

The supporting rolls are rubber covered to prevent marring or scratching the surface of the material and, are so arranged that as the coil decreases in size, the rollers continue to bear on the outside of the coil.

While this particular cradle is designed for 20 in. wide stock as a maximum, narrower coils can be accommodated by simply adjusting either the disc or the end guide, or both. Adjustment of the disc is accomplished by means of a nut and the end guide by means of a handwheel. The cradle is power driven by a variable speed hydraulic unit located in the base of the cradle and is readily accessible through doors located in front. It can be connected in with the starting and stopping mechanism on the feed table so that both will operate simultaneously.

This type of cradle can also be furnished in a heavy duty type, with double discs to accommodate the widest and heaviest coils. Although shown in an inclined position, the single disc coil cradle can also be furnished in an upright position.

Mercury Mfg. Co., Chicago, has announced a new electric industrial elevating platform die handling truck.

Designated as Model A-1006 and rated 4000 lb. capacity, this new vehicle has a load platform 24 in. wide by 48 in. long, which elevates from a lowered

height to 9 in. to a maximum height of 52 in., the truck having an overall height of 66 in. Platform size, height and elevation are subject to variation to meet requirements.

Loading and unloading of dies are facilitated by a double drum electric motor driven winch assembly mounted over the battery compartment which operates from the truck battery. The cables of the winch are hooked on to the heavy tool or die to be handled and the load is pulled on to the load platform, which can be elevated to the height of the machine bed or storage rack.

Removal of loads from platform of the truck is readily effected by reversing the direction of the pull of the cables around the platform sheaves.—H. E. B., Jr.

Publications Available on Machine Tools

Data sheets showing photographs of Gisholt machines at work on regular as well as unusual machining jobs are being distributed by the Gisholt Machine Co., Madison, Wis. Tool layouts show how the jobs were set up and the various operations are described, stating speeds, feeds and time required.*

A single-spindle machine for the manufacture of nut blanks, bearing parts, pin studs, rollers, inner races, washers, and similar plain work requiring relatively simple operation is described in Bulletin M-3902 published by the National Acme Co., Cleveland, Ohio.*

A new Micromax frequency controller of the industrial type is described in Catalog N-56-161 (1) published by Leeds and Northrup Co., Philadelphia, Pa.*

The complete line of power driven machinery built by Duro Metal Products is presented in catalog E-39A, issued by the Power Tool Division of this company.*

Bulletin 64 brought out by the Baldor Electric Co., St. Louis, Mo., contains a description of this company's new No. 714 Deluxe model grinder, which is powered with a 1/2 hp. motor and is furnished with 7 in. by 1 in. wheels made by the Carborundum Co.*

A roll grinding machine in size 36 in., 44 in., 50 in. and 60 in. is the subject of a broadside prepared by the Cincinnati Milling Machine & Cincinnati Grinders, Inc., Cincinnati, Ohio.*

The Fellows Gear Shaper Co., Springfield, Vt., has prepared a pamphlet covering its new involute measuring machine.*

"Quik-Lift," an electric hoist recently announced by the Coffing Hoist Co., Danville, Ill., is described in a folder issued by the manufacturer.*

Honing equipment, mechanically and hydraulically actuated, is described in a pamphlet recently issued by the Micromatic Hone Corp., Detroit.*

* Obtainable from editorial department, AUTOMOTIVE INDUSTRIES. Address Chestnut and 56th Sts., Philadelphia.



In order to give readers of *AUTOMOTIVE INDUSTRIES* a clue to certain merchandising and service aspects of the automotive industry which are normally outside the scope of an industrial publication, we present herewith excerpts from the May issues of the four other magazines published by the Automotive Division of the Chilton Co.

From Motor World Wholesale

Official figures released by the U. S. Department of Commerce reflect the improvement in automotive wholesaling that has taken place this year over last. With 215 jobbers reporting in the monthly survey, total March sales were \$3,336,000, representing an increase of 8.1 per cent over March, 1938, and an increase of 15.8 per cent over February. With 147 jobbers reporting for the first three months of 1939, total sales were \$6,796,000, an increase of 9.1 per cent over the first quarter of last year.

From Motor Age

In San Marino, near Los Angeles, Calif., the original Junior Midget Association holds regular Sunday races before crowds of several thousand people. Boys and girls from six to fourteen years of age drive their one-cylinder cars through a complete series of races.

A former builder of heavy duty trucks is planning to turn out the tiny racers on a commercial scale. These cars, powered by one-cylinder engines, will retail at from \$150 to \$200. They will probably employ chain drives.

From Commercial Car Journal

Truck manufacturers have been having a busy time of it whipping their lines into channels where demand is greatest. An agent who notices these things reports that a new snub-nose camelback will supplement a line of conventional camelbacks, if these two words can be used together. Another manufacturer has rearranged a standard chassis so that it will require no conversion to accommodate a popular multi-stop body of entirely new design on two wheel-bases.

From Automobile Trade Journal

The passenger car dealer who has not been properly introduced to trucks is apt to shy away, feeling that trucks are too far removed from his knowledge to make it worth his while to attempt to sell them. On the other hand, the woods are full of passenger car dealers who do handle trucks, and if you talk to one of them you will invariably get the reaction that he would kick like a steer if someone tried to take the truck franchise away from him.

All of which leads up to the naked truth that a truck line is a profitable venture for the passenger car dealer if—and it is an important “if”—he is willing to study the market, learn his line of trucks, and really go out after the business.

New Process

(Continued from page 618)

blending agents, and do not constitute in themselves complete aviation fuel. Houdry aviation gasoline, when sweetened, acid-treated, and re-distilled, gives a product meeting acid-heat specification, and gum and oxidation tests. Houdry catalytic treating is applicable for the same purpose. Finished Houdry aviation gasoline will be from 76 to 78 ASTM octane number clear grade, or approximately 87, 90, 92 octane number with 1.8 ml., 3 ml., or 4 ml. of tetraethyl lead per gal., respectively. When used for blending with isopentane, isooctane, and similar anti-knock agents, 100-octane-grade fuel, after lead addition, is produced. For example, a typical 100-octane, Army-method (96-octane, motor method) blend, actually marketed, consists of about 25 per cent isooctane, 75 per cent Houdry aviation gasoline, and 2.75 ml. of lead. This blend indicates that only one-half as much isooctane is required as with natural aviation gasoline from selected crude.

All Houdry catalytic operations require regeneration of the catalyst. The catalyst activity decreases during the on-stream period of the cycle due to the accumulation of carbonaceous deposits which, therefore, must be removed periodically. Operating cycles vary from 30 to 135 min. in cracking fuels and gas oils, from 8 to 12 hr. in vapor-phase treating operations, and from 6 to 12 hr. in the polymerization operation. Catalytic containers are arranged so that operation is continuous, some operating while others are regenerating. Changes from case to case are controlled automatically.

The life of the catalyst for treating apparently is unlimited, no deterioration having taken place in actual operation over a year's period. Cracking-plant operations have given practically the same yield over a period of six months. Estimates on new plants have been based on renewing the catalyst after six months, but it is expected that a life of several times this period will be obtained. All catalysts used are molded, solid, and are of different composition—depending on service required. A typical cracking catalyst is an activated hydrosilicate of alumina comprising SiO_2 and Al_2O_3 to the extent of at least 90 per cent, these components being substantially in the ratio of 4 to 1—the material being molded under pressure, dried and baked to produce the catalyst units.

The Houdry process was developed by Socony-Vacuum Oil Co., Inc., and the Sun Oil Company in conjunction with the Houdry Process Corporation, which latter is owned jointly by the two oil companies and by Eugene Houdry and his associates.

At the present time there are in operation three units, viz., a gas-oil catalytic cracker of 2000 bbl.-per-day capacity at the Paulsboro refinery of the Socony-Vacuum Oil Co., Inc., a 3000 bbl.-per-day unit in a Socony European refinery, and a 15,000-bbl. unit charging residuum at the Sun Oil Company's Marcus Hook, Pa., refinery.

CROSLEY—

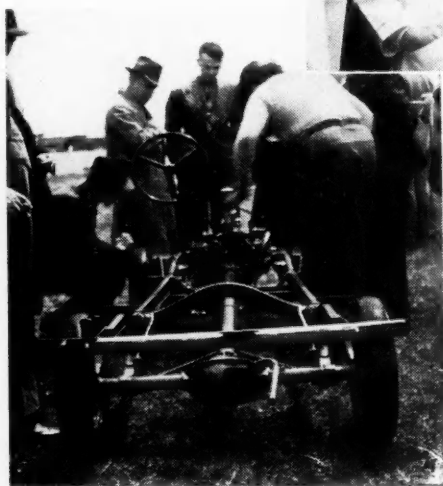
*new car makes initial bow
with test runs at Indianapolis*

At the right is Powel Crosley, Jr. with his grandson Lewis Crosley who christened the new entry in the low priced free-for-all. At the left of the younger Crosley can be seen Jimmy Snyder and Wilbur Shaw who piloted the new models.

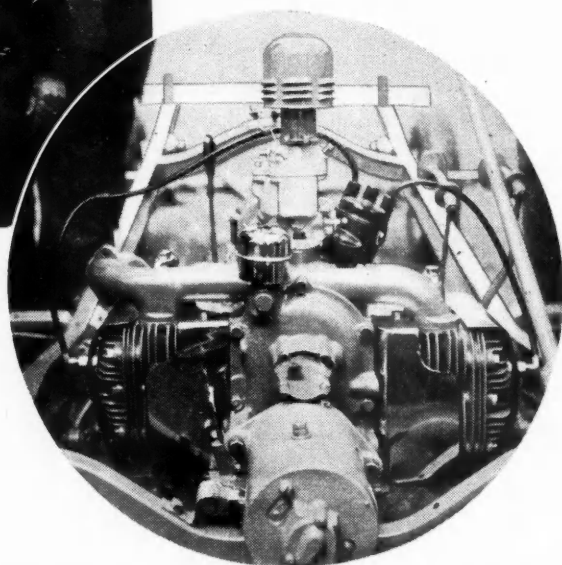


In the circle can be seen the front end of the engine with the starter and cooling fins

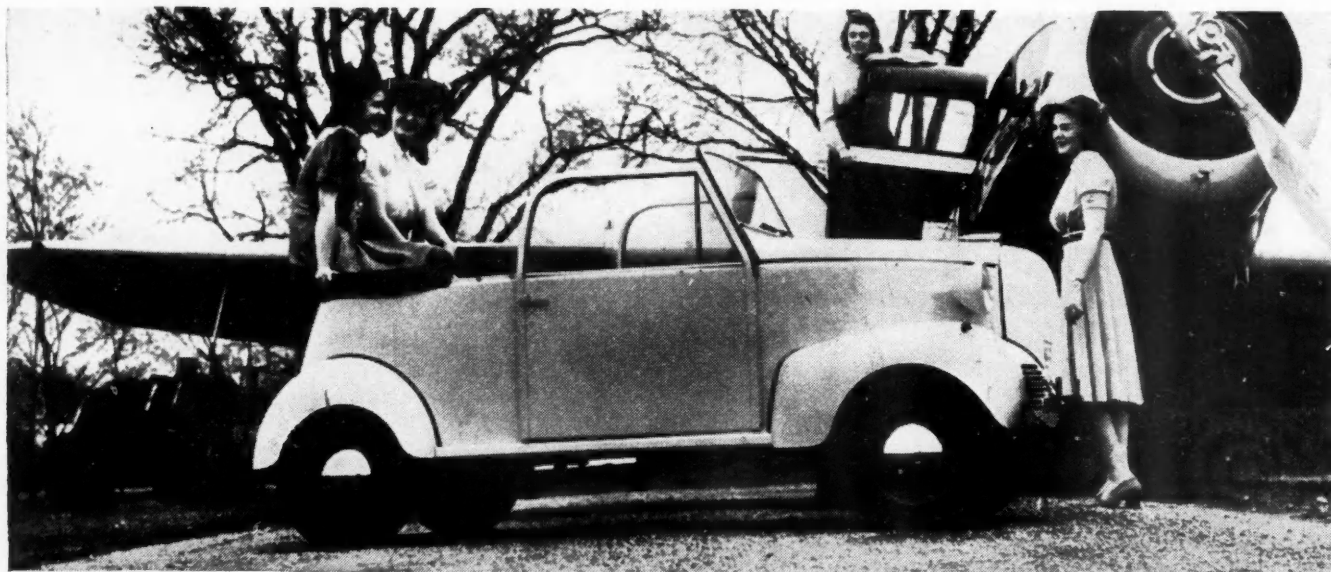
Directly below is a view of the rear end of the new Crosley



Chilton staff photos
by Frank Tighe



The new Crosley car is built along airplane lines to hold down the weight and is designed to maintain a speed of up to 50 m.p.h. on a consumption of 60 m.p.g.



NEWS OF THE INDUSTRY

Noise Is Challenge To World Engineers

German Visitors View U. S. Methods

Engineers throughout the world face a challenge to further reduce noise of automotive equipment, a group of German experts, recently on tour through this country, told AUTOMOTIVE INDUSTRIES in an exclusive interview.

"Designers have done much to reduce noises, as for example in improving gear shift systems, but there is a great deal more to do," one of the engineers said. Hydraulic transmissions were suggested as one method.

In the field of diesel engine design obnoxious fumes continue to be a problem. Where economic considerations require diesel powerplants, these fumes can be overlooked for a while, but the day will soon come when this problem must be solved.

America's industrial expansion, which has made mass production a fact, continues to "amaze any engineer from overseas," one of the experts said. In Europe, he pointed out, many things will continue to be made by the slower, craftsman method because there is not a sufficient market for mass production operations.

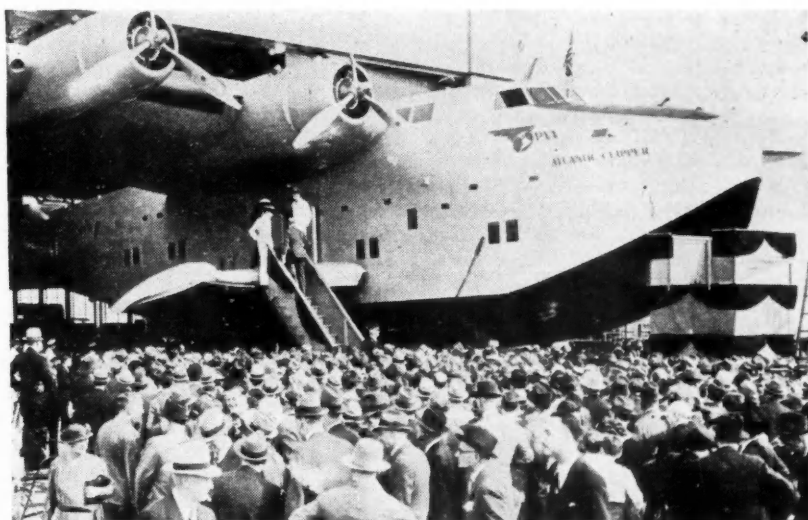
Discussing European traffic systems, several of the German engineers agreed that two separate traffic systems is the only answer. One is the new high-speed highways, such as the German "autoband" which is used exclusively for motorized vehicles—automobiles, buses, trucks, tractors, and motorcycles. The other highway system must continue to be the intricate connecting

(Turn to page 629, please)

GM Allison Plant Begins Expansion

Expansion of the manufacturing facilities of the Allison Engineering division of General Motors in Indianapolis has been announced. A new plant addition of approximately 200,000 sq. ft. will be erected adjacent to the present property in order to expand production facilities on V-type, liquid cooled aviation engines now being manufactured by Allison.

A considerable amount of new pre-



International

Giant and the Dwarfs

The second Pan-American Airways flying boat destined for Trans-Atlantic mail and passenger service this summer is shown towering over the crowd attending its christening in Baltimore. Mrs. Millard Tydings, wife of the U. S. Senator from Maryland, cracked the traditional bottle on its nose and named it "Atlantic Clipper."

cision machinery has been ordered, and the type of work to be done will require the selection of highly skilled operators, it was said. Building plans are now completed and construction of the additional plant facilities will start at an early date.

Electric Autolite Had Good Quarter

Net earnings of \$1,620,903, equal to \$1.35 a share, were reported by Electric Autolite Co. for the first quarter 1939 as compared with a loss of \$32,242 in the same period last year. Royce G. Martin, president, said April sales and releases for May indicate a favorable second quarter.

All officers of the company have been reelected, with Walter V. Flood, comptroller, being made vice-president and comptroller.

Crosley Order

Waukesha Motors Co. has announced an initial order for 5,000 two-cylinder engines for use in the new Crosley car. The order, it was stated, is expected to be completed by the end of July.

Reo Directors Again Changed

After a proxy battle which delayed a meeting of the stockholders of the Reo Motor Car Co. for 10 days, a syndicate headed by Thomas Campbell, a New York attorney, emerged victorious and named five new directors to replace others named recently in a compromise during the receivership hearings in the U. S. District Court in Detroit. The change of directors is the fourth in little more than a year.

The Campbell group named its full slate of five candidates by changing the by-laws to increase directors from eight to nine. Named to the board were Col. E. J. Hall, Palo Alto, Cal.; Wm. B. Mayo, former chief engineer, Ford Motor Co.; E. J. Connolly, vice-president, Hayes Body Co.; J. W. Robb, president, American Car and Foundry Co.; F. G. Alborn, former chief engineer, White Motor Car Co.

Former directors reelected were—O. A. Seyferth, Guy Hack (labor representative), Hugo Lundberg and E. E. Smith. The change in directors is subject to confirmation by the Federal Court.

Higher Mass-Distributor Tire Prices Foreseen by Industry

FTC Order Against U. S. Rubber Co. May Lead to Revised Bonus System

Sweeping revision of the tire industry's pricing system, with either modification or complete abandonment of cumulative volume bonus schedules, looms as a strong and early probability as result of the Federal Trade Commission's Cease and Desist order issued against the United States Rubber Co. The company was charged with illegal price discrimination against small dealers, and in favor of its larger dealers and its mass distributor customers.

In its formal answer filed April 7 to the Commission's complaint, the company admitted the facts as to price discrimination and price differentials, as contained in the complaint.

Of immediate concern to all tire manufacturers is the Commission order to the U. S. Rubber Co. to cease discrimination between different dealers by granting cumulative discounts dependent upon the volume or purchases of tires during a specified period. For many years major tire manufacturers, under their pricing programs, have maintained bonus-for-volume schedules, giving dealers, in the form of merchandise credits, bonuses dependent upon their orders over the period of a year. While trade and special discounts show on the face of the invoice to the dealer, the bonus has, under the plan, been cumulative over the period of a year, payable either quarterly, semi-annually or annually. These bonuses for volume have ranged, under the fluctuation programs of major manufacturers, from one per cent on \$1,000 worth of annual

business up to 10 per cent on \$15,000 volume and 12 per cent on \$35,000 volume to a bonus program starting at three per cent on \$1,500 annual volume and going as high as 15 per cent on \$50,000 volume. In addition to these so-called earned bonuses, manufacturers at times have given dealers guaranteed bonuses of 15 per cent on top of regular trade discounts, monthly bonuses, distributor discounts, warehouse discount and carload discounts.

In all probability the bonus-for-volume plan will be changed to a quantity discount, applicable to each individual order in proportion to its size.

With respect to the Commission's order to the company to cease its price discrimination in favor of its mass-distributor customers, industry observers see as result a general upward revision of mass-distributor tire prices, which they say will help the industry generally, compel large distributors to adhere to price schedules and stop wanton price cutting and discount giving.

Prior to the enactment of the Robinson-Patman Act, Goodyear Tire & Rubber Co. made all Sears-Roebuck private brand tires; United States Rubber made Montgomery-Ward tires and about half of Atlas tires for Standard Oil, the B. F. Goodrich Co. having the balance of the Standard Oil contract. Goodyear terminated its hundred million dollar Sears-Roebuck 10-year tire contract (which the Federal Trade Commission has attacked as illegal under the Clayton Act) the company

claiming it did so not to comply with the Commission's cease and desist order, but because of provisions of the Robinson-Patman Act. Goodrich at the same time dropped its share of the Atlas tire contract and the United States Rubber Company assumed the entire Atlas contract and since that time has made all Atlas tires for Standard Oil marketing.

Goodyear appealed the Commission's order and the Cincinnati Circuit Court of Appeals recently reversed the Federal Trade Commission, holding the issues moot because the contract was no longer in force, and also finding that the price differential was justified by the quantity involved. The Commission is expected to carry the case to the Supreme Court this month.

It is considered possible that the United States Rubber Co., having admitted the facts as contained in the Commission's complaint, and having submitted voluntarily to a formal cease and desist order, will now appeal the order to the U. S. Circuit Courts, to have the courts determine whether or not the price differentials were in actual violation of the Robinson-Patman Act. In its answer the company reserved the right to appeal.

Divco-Twin Truck New Sales Records

Each month of the fiscal year which started last Nov. 1 has been ahead of any corresponding month in the history of the Divco-Twin Truck Co., and there is at present a substantial backlog of orders on hand.

Scheduled for completion about Aug. 1 is the construction of a new plant for the company. Work has already started. Estimated cost of the land, buildings and machinery in the program is about \$440,000.

New Passenger Car Registrations*

	MARCH	FEBRUARY	MARCH	THREE MONTHS		Per Cent Change, 3 Months, 1939 over 1938	Per Cent of Total Three Months		FIVE MONTHS MODEL YEAR		Per Cent Change
	1939	1939	1938	1939	1938		1939	1938	1939	1938	
Chevrolet	58,383	38,544	45,080	143,398	109,145	+ 31.3	23.47	24.60	247,382	214,560	+ 15.0
Ford	42,698	30,773	35,441	111,012	99,482	+ 11.6	18.17	22.43	177,598	146,852	+ 21.0
Plymouth	34,910	23,956	23,341	88,826	55,402	+ 60.3	14.54	12.49	156,118	105,081	+ 48.3
Buick	19,320	12,921	15,059	48,079	35,590	+ 35.0	7.87	8.02	85,910	69,398	+ 24.0
Dodge	18,873	12,401	10,319	46,861	24,859	+ 88.3	7.67	5.60	74,930	50,470	+ 48.8
Pontiac	14,386	9,369	9,701	35,260	23,099	+ 53.1	5.77	5.21	61,060	45,986	+ 32.8
Oldsmobile	12,880	8,750	9,035	33,049	21,642	+ 52.7	5.41	4.88	58,452	41,791	+ 39.8
Chrysler	6,752	4,632	4,590	17,261	11,615	+ 48.8	2.82	2.62	28,058	23,978	+ 17.0
Mercury	5,245	3,538		13,293			2.18		20,128		
Nash	5,329	3,308	3,144	12,537	8,089	+ 55.0	2.05	1.82	18,141	15,435	+ 17.5
De Soto	5,114	3,190	3,798	12,256	8,896	+ 37.8	2.00	2.00	20,341	18,079	+ 12.5
Hudson	4,410	3,032	4,158	11,002	9,953	+ 10.5	1.80	2.24	20,409	19,222	+ 6.0
Studebaker	4,397	3,011	3,231	10,908	8,306	+ 31.3	1.78	1.87	20,376	16,007	+ 27.1
Packard	3,745	2,664	4,743	9,497	11,471	- 17.1	1.55	2.59	18,564	22,280	- 16.5
Lincoln	1,718	1,379	1,610	5,035	4,618	+ 9.0	.82	1.04	8,397	8,058	+ 4.0
La Salle	1,917	1,308	1,201	5,019	3,092	+ 62.4	.82	.70	9,623	6,531	+ 47.5
Cadillac	1,099	918	1,036	3,299	2,652	+ 24.8	.54	.60	5,955	3,909	+ 52.1
Willys-Overland	1,023	747	1,247	2,748	3,663	- 25.0	.45	.83	4,670	8,116	- 42.5
Graham	402	277	479	1,029	1,393	- 26.1	.17	.31	1,743	2,753	- 36.6
Hupmobile	57	36	91	154	246	- 37.4	.03	.06	255	352	- 27.5
Miscellaneous	202	188	183	491	398	+ 23.2	.09	.09	790	844	- 6.3
Total	242,860	164,942	177,487	611,014	443,611	+ 38.0	100.00	100.00	1,038,840	819,702	+ 26.9
Chrysler Corp.	65,649	44,179	42,048	165,204	100,772	+ 65.1	27.04	22.72	279,447	197,608	+ 41.2
Ford Motor Co.	49,661	35,690	37,051	129,340	104,100	+ 24.1	21.17	23.47	206,123	154,910	+ 33.0
General Motors	107,985	71,810	81,112	268,104	195,220	+ 37.2	43.88	44.00	468,322	382,175	+ 22.4
All Others	19,565	13,263	17,276	48,366	43,519	+ 11.0	7.91	9.81	84,948	85,009	- None

* Complete except for Tennessee for March in all calculations.

Expect Goodyear to Deny NLRB Charges

Predict URW Hearing May Last Long Time

One of the largest and lengthiest hearings ever conducted by the National Labor Relations Board looms in Akron as the United Rubber Workers Union of the CIO and the Goodyear Tire & Rubber Co. prepare respectively to prosecute and resist charges contained in the board's complaint filed against Goodyear on petition of the URW.

Issuance of the complaint charging Goodyear with numerous violations of the Wagner Act, culminated four months of investigation by NLRB representatives who examined more than 500 Goodyear employees.

Goodyear's answer is expected to be a formal denial "for the record" of all of the charges made. Prospects are that hundreds of witnesses will be called to testify before a special trial examiner to be named later. After that, large numbers of witnesses will be called by the United Rubber Workers Union in support of the complaint, and by the Goodyear Co. and the Goodyear Independent Employees Association, in defense of the charges made. That the case may extend over a period of months, and possibly years, is being predicted in Akron industrial circles.

Goodyear is the only major tire company which does not have a contract with the URW, although the URW has won collective bargaining rights at Goodyear. Following riots last Memorial Day it was indicated that proceedings leading to a contract would be entered into at once, but to date no agreement for contract terms has been reached and the union has frequently and openly charged Goodyear with "stalling."

The NLRB's complaint makes the following four main charges of alleged unfair labor practices:

1—That Goodyear interfered with, restrained and coerced employees in the exercise of their collective bargaining rights in 20 specific ways.

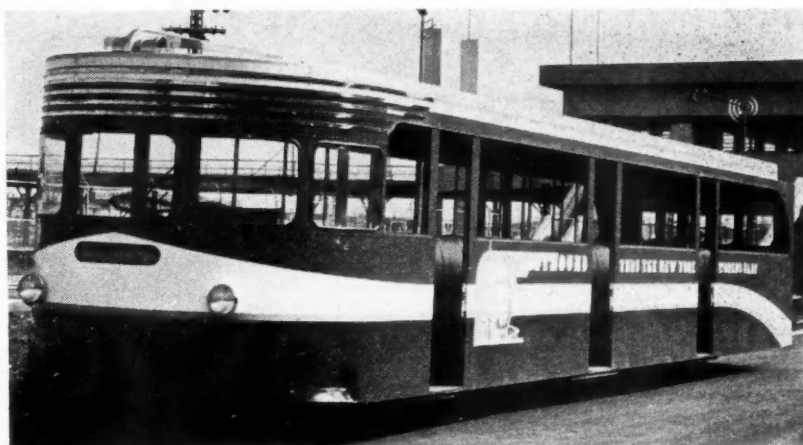
2—That it dominated and favored the Akron Goodyear Employees' Association in 10 specific ways.

3—That 77 union employees were discharged, demoted, laid off or refused rehiring because of union activity.

4—That the company has refused and continues to refuse to bargain in good faith with the accredited bargaining agent, Goodyear local, URWA.

The board's complaint includes the allegation that the company "provoked" the riot of May 26 and "encouraged and tolerated and permitted its agents and employees to participate in a violent and brutal attack upon the officers and members of said union, both on the public thoroughfares of the city of Akron and in the hall of the union."

The charge is also made that the company removed certain operations



Underwood & Underwood

For the Fair's Footsore

A welcome sight to New York World's Fair visitors who fear aching feet from trudging about the miles of exhibits will be the fleet of buses operated by Greyhound Lines. Unusual in appearance, these buses will add to the modern appearance of the many exhibits.

from Akron, threatened to remove others and falsely blamed the union for curtailment of operations in Akron in order to discourage union activity and bring the union into disrepute.

Goodyear's flying squadron is hit as an organization used for "spying" and "strike-breaking." It is claimed that squadron members were denied the privilege of union affiliation and that union members were refused appointments to the squadron.

Link-Belt Acquires Speeder Machinery

Consolidation of Speeder Machinery Corp., Cedar Rapids, Iowa, manufacturers of power operated excavating and materials handling shovels-draglines-cranes, and the Shovel division of Link-Belt Co., has been announced by Alfred Kauffmann, president of Link-Belt Co.

For the present each organization will continue to operate independently, the announcement stated. The merger consolidates the products of these two well known manufacturers into a line of shovels-draglines-cranes ranging from $\frac{3}{4}$ yard to the $2\frac{1}{2}$ yard crawler-mounted units. This change also makes available to the Speeder Machinery Corp. a full size range of Link-Belt locomotive cranes.

Speeder Machinery Corp. will be operated as a subsidiary of Link-Belt Co. with the present management continuing to operate the business. T. M. Deal will continue as president.

Motor Wheel Report

Net profit of the Motor Wheel Corp. for the quarter ended Mar. 31, 1939, has been reported by the company as \$420,404.85. Profit for 12 months ended Mar. 31 was indicated as \$1,111,600.58. In the first quarter of 1938 a loss of \$69,415.79 was shown.

Stearman-Hammond Acquiring Capital

Now that the Federal Court has confirmed the reorganization plan of Stearman-Hammond Aircraft Corp., San Francisco, operations have been started to acquire \$45,000 working capital for the company, which is made a condition of the reorganization. Only after the \$45,000 is obtained, and placed in escrow, will the plan of reorganization be placed in effect.

The new company will concentrate on contract work and will make a special effort to expand an airplane part and accessories business, and will not actively pursue its former policy of confining its operations to the manufacture of new planes.

It is reported that assurances have been received that parts business will be available upon completion of financing.

Hupp Financial Report

Hupp Motor Car Corp. in its annual report to stockholders reported a loss of \$2,090,742.00 for the year ended Dec. 31, 1938. The report stated that production of the company's Senior sixes and eights would be completed this month, and all facilities will be concentrated on production of its Skylarks for the remainder of this model year.

United Aircraft Declares Dividend

The board of directors of United Aircraft Corp. has declared a dividend of 75c. per share on the capital stock of this corporation. The dividend will be payable June 15 to stockholders of record at the close of business June 1. As of recent there were approximately 2,649,437 shares of capital stock outstanding.

Fear Pressure on Steel Prices Unless Buying Move Develops

Makers of Steel for Automotive Use Fared Best in First Quarter Business

Until automobile manufacturers return to the steel market with round tonnage orders, little in the way of a change for the better is looked for. For some of the rolling mills the present rate of demand means the break-even point. Others operate their units intermittently, permitting fill-in orders to accumulate until their aggregate justifies operating for a certain period. There may be theoretical solace in the growth of miscellaneous uses for steel, but steel company sales managers see little hope for a genuine revival of activity until some such buying movement, as that which got under way last October with the coming into the market of the large automobile manufacturers for round tonnages of flat rolled steels, begins to make itself felt. It is interesting to note that steel producers with the largest capacity for rolling the types of steel used in bodies, fenders and automobile parts generally fared much better during the first quarter of the year in point of earnings than did those with facilities chiefly aimed at the output of steel in its heavier forms. That prevailing conditions will result in heavy pressure on the steel market's price structure, is a fear shared by all producers. This pressure, however, will result, as it has usually in the past under like conditions, from competition among the steel mills rather than from what large steel buyers may or may not do.

Pig iron output has been trimmed sharply to conserve coal stocks, but stocks on hand are ample. Operations of steel mills have been little affected so far by the coal situation.

Tin moved into higher price ground recently with spot Straits selling at 49¼ cents, thus bringing into sight 50 cent tin. London advices said that buying orders from the United States were chiefly responsible for the sharp advance in that market to the highest price since October 1937. Straits tin sold at 45 cents in New York three months ago, and the \$100 per ton advance since then, while not entirely unexpected, caused consumers to wonder when the ambitious program of the International Tin Pool would slow down. The United Press correspondent at London cabled it was rumored there that the Netherlands was restricting sales of Dutch East Indies tin to the United States under pressure from Germany. Representatives of tin producers in New York did not put any credence in these reports. Smelter output in Singapore and Penang was reported to have been speeded up, April production having been double that of March.

Heavy inquiries for copper, suppos-

edly for armament purposes, were reported. The U. S. Navy asked for tenders on more than 2,500,000 pounds and London was reported to have put out inquiries for 1,500,000 pounds. One of the large mine producers stated that there was every reason for advancing the price of copper on the basis of the outlook.

Further reduction in the price of beryllium copper brings that alloy nearer to the point of quantity consumption, but at \$15 per pound of contained beryllium—it was formerly \$30—its use naturally is still limited. —W. C. H.

ADVERTISING

S. F. Woodall, advertising manager of Packard Motors Export Corp., New York, has been reelected president of the Export Advertising Association. Data on advertising media and rates in foreign countries will be gathered by the association, which will act as a clearing house for information for foreign advertisers.

F. B. McConnell, formerly assistant to the president and secretary of Sears, Roebuck & Co., Chicago, has been appointed vice-president in charge of retail administration. He was formerly supervisor of automotive equipment sales. E. P. Brooks, formerly factory supervisor, was named vice-president in charge of factories.

Batten, Barton, Durstine & Osborn, Pittsburgh, has been appointed the agency for the Automobile Finance Co., of that city.

Hugh W. Stephens has been appointed public relations director of the Northwest Airlines, St. Paul.

Hugh W. Hitchcock, assistant advertising manager of Packard Motor Co. since 1933, has been named advertising manager. He joined Packard 17 years ago.

Ray E. Williams has resigned as assistant advertising and sales promotion manager of Shell Oil Co., St. Louis.

John C. McGuire is the newly-elected president of the Advertising and Sales Club of Windsor. Mr. McGuire is sales manager of the Chrysler-Plymouth-Fargo divisions of the Chrysler Corp. of Canada. Other officers include H. J. G. Jackson, Chrysler Corp., as one of the directors.

Gerry H. England, account executive with Ruthrauff & Ryan agency, has been appointed to the new post of advertising and sales promotion manager of Electric Auto-Lite Co., Toledo.

John F. Saunders, formerly with Batten, Barton, Durstine & Osborn, has joined the Paris & Peart agency, in charge of the Pennsylvania Refining Co. account, among others.

N. W. Ayer & Son, Inc., will move its New York headquarters into the RCA Building, Rockefeller Center, it was announced this week.

Leslie C. Allman has been appointed vice-president and director of public relations of Fruehauf Trailer Co., Detroit. He has been sales and advertising manager with the company for the past ten years.

New Truck Registrations*

	March 1939	February 1939	March 1938	THREE MONTHS		Per Cent Change, 3 Months 1939 over 1938	Per Cent of Total Three Months	
				1939	1938		1939	1938
Chevrolet.....	15,933	12,007	12,151	41,555	31,663	+ 31.0	36.01	33.10
Ford.....	11,541	9,224	9,874	30,953	27,041	+ 14.5	26.82	26.27
International.....	5,315	4,284	5,216	14,308	13,644	+ 5.0	12.40	14.26
Dodge.....	4,736	3,821	3,640	12,559	9,462	+ 32.7	10.88	9.89
G. M. C.....	2,651	2,218	1,941	7,253	5,142	+ 41.1	6.26	5.38
Plymouth.....	853	510	782	1,870	2,060	- 9.2	1.62	2.15
Mack.....	473	398	356	1,353	836	+ 62.0	1.17	.87
Diamond T.....	392	308	392	1,078	1,099	- 2.0	.93	1.15
White.....	343	255	344	931	889	+ 4.9	.81	.93
Studebaker.....	190	143	161	502	469	+ 7.0	.43	.49
Reo.....	172	159	286	499	687	- 27.2	.43	.72
Autocar.....	150	134	110	427	336	+ 27.1	.37	.35
Brookway.....	168	98	86	393	207	+ 90.0	.34	.22
Diveco.....	143	148	82	366	168	+ 118.0	.32	.18
Willys-Overland.....	144	97	174	329	495	- 33.5	.29	.52
Federal.....	116	79	131	280	359	- 22.0	.24	.38
Hudson.....	39	44	78	130	262	- 50.4	.11	.27
Bantam.....	58	38		129			.11	
Sterling.....	17	29	17	71	42	+ 69.0	.06	.04
Stewart.....	5	11	32	63	79	- 20.2	.05	.08
Indiana.....	24	20	40	59	115	- 48.8	.05	.12
F. W. D.....	10	15	17	48	110	- 56.4	.04	.11
Miscellaneous.....	136	62	201	270	492	- 45.1	.24	.52
Total.....	43,609	34,102	36,111	115,426	95,657	+ 21.0	100.00	100.00

*Complete except for Tennessee for March.

Challenge

(Continued from page 625)

highways between villages and towns, to serve the horse-drawn vehicles, bicycles, pedestrians, and the motor vehicles running between these smaller centers of population.

A factor in rural Germany which establishes this fact is that most farmers live in villages. Every morning they drive their wagons to their farm land, work there all day, and return at nightfall to their homes, or haul their produce to the village markets. Hence this secondary highway system is of great economic importance, and must be maintained and constantly improved.

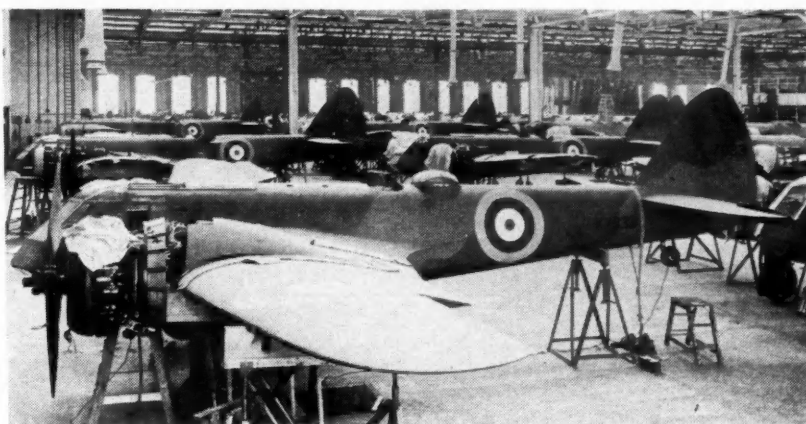
Stainless steel used in such profusion in this country impressed the group. The large number of trucks built with stainless alloys, the vast array of accessories, and the widening use of this material in building construction was a topic of lively comment during the interview.

The World's Fair in New York was indeed a fairy-land of industry, two of the engineers who visited the spectacle before the others had an opportunity to do so, said. "Fantastic" were the lighting effects; the automotive exhibits amazed them.

U. S. Tractor Exports Declined in March

Showing a 5 per cent decline, March, 1939, exports of tractors, parts and accessories totaled \$4,873,830 against \$5,134,980 in the same month of 1938, according to the Machinery Division, Department of Commerce. Wheel tractor shipments were 14 per cent lower than a year ago, \$2,008,217—\$2,320,526, practically all of the decline being recorded in the 33 and larger horsepower sizes. The detailed figures by size classes are: 14 belt hp. and under, \$197,846—\$81,075; 15-32 hp., \$1,341,545—\$1,364,128; 33 and over hp., \$468,826—\$875,323.

Shipments abroad of tracklaying tractors were off 4 per cent, the trade in the fuel injection type increasing by 16 per cent in contrast to a 30 per cent decline in the carburetor type. The fuel injection type shipments totaled \$1,267,756 compared with \$1,097,483 a year ago, distributed unusually



Globe

Latest Blenheim

Shown on the production line are the latest Blenheim bombers now being built for Great Britain's Royal Air Force. This model is a modified version of the famous Bristol high-speed twin-engine bombing plane, of which many hundreds are now in service. Most noticeable difference in the new model is the unusual shape of the nose, which has been extended approximately three feet and is designed to provide better facilities for navigation, bombing, etc.

evenly over the 3 size classes as follows: Under 35 drawbar hp., \$304,688—\$124,137; 35-59 hp., \$418,949—\$554,270; 60 and over drawbar hp., \$554,119—\$419,076. The carburetor type exports amounted to \$585,019 against \$832,587, with most of the trade being done as usual in the smaller size class: Under 35 drawbar hp., \$518,891—\$661,560; 35-59 hp., \$40,804—\$133,234; 60 and over hp., \$25,324—\$37,793. Exports of tractor parts and accessories in March of the present year totaled \$1,002,997 against \$878,012 in March 1938.

New Tennessee Plant For B. F. Goodrich Co.

The B. F. Goodrich Co., which now has its parent factories in Akron, branch tire factories in Los Angeles and Oaks, Pa., and a mechanical goods plant at Cadillac, Mich., will build a new \$1,500,000 mechanical goods factory at Clarksville, Tenn. A 30-acre tract at Clarksville has been purchased.

The new plant will be a one-story structure 206 by 1000 ft. President S. B. Robertson of Goodrich states: "De-

cision to build a new plant followed a two-year period of intensive study of industrial surveys, looking to the development of production facilities of the greatest long-range value to the company."

Graham Reports Loss in 1938

Financial report of the Graham-Paige Motors Corp. for the year ended Dec. 31, 1938, presented at the company's annual stockholders meeting, indicated a net loss of \$1,920,186.38. Gross revenue for 1938 from the sale of 3,902 cars and 1,532 tractors amounted to \$4,782,448.09 compared with \$13,060,226.42 from the sale of 16,577 cars and 243 tractors for the year 1937.

Trim Company Seeks Capital

A special stockholders' meeting of National Automotive Fibres, Inc., manufacturer of automobile seat cushions, backs and interior trim, was called for May 10 at San Francisco to vote on a plan for obtaining additional capital. The plan, as outlined included the sale of 200,000 shares of \$10 par value preferred stock. The new stock will have voting rights with the common and will be convertible into common on a share for share basis. It is anticipated that sales will net the company \$1,900,000.

National Automotive Fibres, Inc., operates plants in Los Angeles and Detroit, and also owns patented machinery under royalty rights in Detroit plants of independent body makers. Purpose of the issue, it was said, is to retire an R.F.C. loan of \$1,500,000 and to call the present outstanding preferred stock.

Royalty

Henry Ford, something of royalty himself in an industrial sense, is pictured with Prince Frederick and Princess Ingrid of Denmark when the royal couple visited the Ford Dearborn plant during their recent trip across the country.



International

Ford Co. Adopts Group Insurance

For the first time in its history the Ford Motor Co. has arranged to accept group insurance for more than 100,000 of its employes throughout the United States.

Life insurance policies of \$1,500, with sick and accident benefits, will be available to Ford employes through an employe contributory plan, starting June 1.

The Ford company will pay approximately half of the cost of the insurance, an insurance agent who handled the deal was reported as saying. Actual cost to the workmen will be "about 20 per cent of what they would have to pay in the insurance market for it."

All employes who have worked for Ford two years or more are eligible for the insurance.

There are approximately 110,000 Ford employes in plants throughout the United States. A Ford official said 95 per cent of the employes would be eligible.

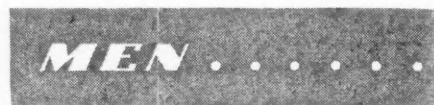
The company will pay the insurance cost over a stipulated amount to be paid by each Ford employe for the insurance. This amount to be paid by the employes has not yet been decided.

Insurance specialists are still working out the details of the plan.

Grumman Aircraft Speeds Production

With receipt of additional orders from the Navy reported, Grumman Aircraft Engineering Corp. is said to have stepped up production to a level well above a year ago. The company is reported expanding its plant to provide for considerable larger engineering facilities in anticipation of additional business from the national defense program.

The company's deliveries for four months ended April 30 were stated as amounting to \$1,755,474 against \$1,416,480 for the same period in 1938—an increase of 24 per cent. Backlog of unfilled orders as of May 1 was given as \$3,635,000.



L. J. Skinitzero, for the past five years with the Chrysler Corp., has joined Willys Export Corp. and will do special work in the Caribbean area.

C. H. Betts has been transferred from Chicago to Detroit to succeed W. Myers as assistant sales promotion manager of Cadillac-LaSalle. Mr. Myers has become associated with the art firm Welch & Trumpfeller.

D. D. Hogate, who has been in charge of the Detroit office of the department of public relations of General Motors Corp., has been transferred to the staff of W. S. Knudsen, president, to develop inter-city communications of the company. F. F. Bruner will succeed Mr. Hogate in charge of the Detroit office.

Promotion of M. J. O'Neill has been announced from director of sales to vice-president in charge of sales for the Monarch Governor Co.

W. H. Cobb, for the past several years general factory manager, mechanical goods plants, U. S. Rubber Co., has been appointed general manager of the mechanical goods and general products division.

Retiring officers of General Motors Corp. have been reelected for the ensuing year, with the following changes:

B. D. Kunkle and E. R. Breech were elected vice-presidents of the corporation and members of the administration committee. Graeme K. Howard, general manager of overseas operations, was elected a vice-president. W. S. Knudsen, president, was designated as chairman of the administration committee and C. E. Wilson was designated as vice-chairman. The office of executive vice-president, which has been vacant since Mr. Knudsen became president of the corporation, was reestablished by the election of C. E. Wilson, vice-president, to that position, with headquarters in Detroit.

Greenfield Tap & Die Corp. has announced several personnel changes. C. C. Ziegler, formerly Western district sales manager, has been elected vice-president in charge of sales, with headquarters at Greenfield, Mass. E. C. Bryant, formerly manager of the gage department, has been appointed Western district sales manager, with headquarters at Chicago. E. C. Bailey, formerly sales promotion manager, has been appointed Eastern district sales manager, with headquarters at New York, succeeding Charles H. Coe, who died on March 28.

Glen Stimson, formerly chief engineer at the Detroit plant, has been appointed gage sales manager, with headquarters at Greenfield. These changes were due to the resignation of W. B. duMont.

First Quarter Passenger Car Exports Fall 12 Per Cent

As indicated in the appended table, exports of passenger cars and chassis from the United States for the first quarter 1939, numbering 48,890, were nearly 12 per cent under exports for the same period in 1938. Exports for March increased nearly 7 per cent.

Exports of aircraft engines also fell off during the first quarter 1939, showing a decrease of approximately 14 per cent from the same period last year. March exports of aircraft engines were less than for the same month last year by nearly 25 per cent.

	THREE MONTHS ENDED MARCH 1939-38							
	MARCH 1939		MARCH 1938		1939		1938	
	No.	Value	No.	Value	No.	Value	No.	Value
EXPORTS								
Automobiles, parts and accessories		\$ 23,503,655		\$ 28,971,029		\$ 75,235,094		\$ 91,454,251
PASSENGER CARS								
Passenger cars and chassis	17,874	11,165,435	16,558	10,613,206	48,890	29,983,679	55,407	34,703,056
Low price range \$850 inclusive	15,873	9,045,259	14,507	8,294,202	43,221	23,963,038	48,233	26,887,646
Medium price range over \$850 to \$1,200	1,732	1,648,136	1,799	1,735,913	4,876	4,666,708	6,143	6,087,734
\$1,200 to \$2,000	216	323,892	283	408,626	648	980,155	812	1,198,574
Over \$2,000	53	148,148	69	174,465	147	373,778	219	529,102
COMMERCIAL VEHICLES								
Motor trucks, buses and chassis (total)	12,045	7,800,590	13,668	8,590,973	31,996	19,752,262	43,543	26,245,655
Under one ton	1,947	869,259	1,379	669,142	4,655	1,963,800	5,784	2,360,162
One and up to 1½ tons	8,383	4,765,168	10,339	5,866,618	22,611	12,048,185	31,336	16,828,243
Over 1½ tons to 2½ tons	952	842,926	1,237	1,025,580	3,086	2,682,306	4,341	3,465,223
Over 2½ tons	679	1,235,338	536	901,542	1,351	2,806,131	1,528	3,221,923
Bus chassis	84	87,899	177	128,091	293	231,840	554	370,104
PARTS, ETC.								
Parts except engines and tires								
Automobile unit assemblies		4,340,434		4,849,071		12,080,509		16,236,592
Automobile parts for replacement (n.e.s.)		3,485,967		3,527,700		9,242,718		9,433,655
Other automobile accessories (n.e.s.)		327,760		283,506		871,772		859,451
Automobile service appliances		507,885		565,052		1,435,235		1,500,170
Airplanes, seaplanes and other aircraft	132	5,948,019	61	3,492,805	318	12,659,798	159	7,041,038
Parts of airplanes, except engines and tires		1,335,886		1,916,320		3,574,632		5,472,762
INTERNAL COMBUSTION ENGINES								
Stationary and portable								
Diesel and semi-Diesel	59	195,578	61	153,691	99	308,455	122	676,040
Other stationary and portable								
Not over 10 hp.	2,057	94,017	1,224	85,632	3,483	188,002	2,988	211,934
Over 10 hp.	89	84,017	99	87,314	283	247,668	757	275,603
Engines for:								
Motor trucks and buses	2,804	331,985	2,461	245,557	7,837	911,763	9,665	1,106,319
Passenger cars	4,257	467,217	5,627	439,196	9,208	884,101	18,597	1,503,628
Aircraft	77	475,237	102	538,832	261	1,739,234	304	1,734,492
Accessories and parts (carburetors)		217,591		248,943		610,023		729,214
IMPORTS								
Automobiles (durable)	54	36,019	34	22,414	129	96,105	187	109,374

formerly vice-president in charge of sales, and E. C. Paddock, formerly assistant to Mr. duMont.

A. F. Jenkins, of Winnipeg, Man., has joined the Willys Export Corporation, as sales manager for Canada with headquarters at Toronto, Ont. Mr. Jenkins sold some of the first Willys cars which were retailed in Canada.

William H. Lewis and Frederick W. Conant have been elected directors of the Douglas Aircraft Corp., replacing Harry H. Wetzel, formerly senior vice-president and general manager, deceased, and Reeves Taylor, who resigned some time ago upon his acceptance of the presidency of the Union Oil Company of California. Lewis, member of the Comptrollers' Institute of America, has been comptroller of Douglas since May, 1937. Conant is an engineer and now holds the position of assistant general manager.

Westinghouse Electric and Manufacturing Co. announces that R. B. Mildon, vice-president, formerly in charge of the East Pittsburgh division, moves to Pittsburgh headquarters of the company to assume special sales assignments. The appointment of A. C. Streamer, formerly manager of the switchgear division, as general manager of the East Pittsburgh division was announced at the same time.

R. W. Conder has been appointed director of labor relations for the Chrysler Corp. Mr. Conder has been active in negotiations between the corporation and its employees for the past two and a half years.

Automotive News from the Orient

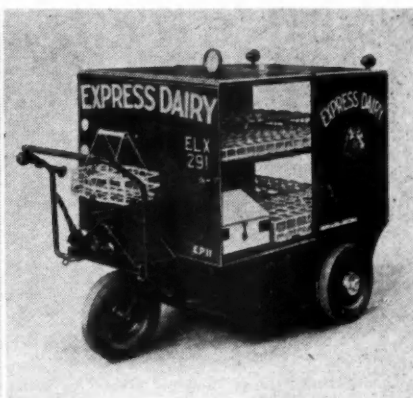
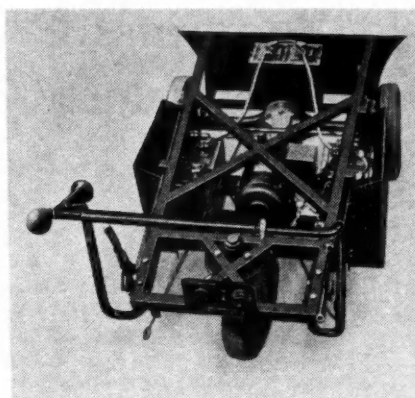
Plans Production Boost

Japan, Manchukuo and China, upon completion of a three-year plan for expansion of industrial productive activity, will be self-sufficient in iron, steel, light metals and automobiles in the spring of 1942, if the project pans out per schedule.

The relative increases, as announced by the Cabinet Planning Board, for some important materials are planned as follows, with unofficially estimated recent production figures added.

Item	1938 Output (Estimate for Japan only)	1942
Steel	6,000,000 tons	60
Special steels .....	.....	100
Aluminum	12,000 tons	100
Copper	87,000 tons	80 plus
Synthetic motor fuel .....	.....	2,900
Machine tools .....	.....	100 plus
Automobiles	30,000	500

It came as a surprise to many observers that no provision was made in the plan for the production of synthetic rubber, although a large State controlled firm was recently established in Manchukuo for the purpose of producing rubber synthetically from car-



International

Pedestrian Controlled Truck

An English firm, T. H. Lewis, Ltd., has introduced this pedestrian-controlled truck driven by a $\frac{3}{4}$ -hp. electric motor. It weighs approximately 700 lb., has a range of 10 miles on one charge and a speed of 3 m.p.h. Express Dairy Co., London, milk retailers, have acquired a fleet of 86 of these "Lewis Prams," as they are termed, for house-to-house deliveries.

The chassis has a welded frame of light channel section and a steel-paneled body welded to it. The electric motor is amidships driving two front wheels through a differential and bevel-gear axle. The single rear wheel is pivot-mounted for steering by a handle-bar at the back, to which the controls are attached.

Casing Shipments Up 64 Per Cent

Shipments of pneumatic casings during March amounted to 4,582,655 units, the highest month's shipments since August, 1937, according to figures released by the Rubber Manufacturers Association. March shipments were 22.6 per cent above the February figure of 3,738,696 casings and were

64 per cent over shipments made in March, 1938. Shipments of casings to automobile manufacturers amounted to 1,746,999, which compares with 1,472,356 for February and 841,202 for March, 1938. Replacement shipments for March were 2,719,450 as against 2,159,901 for February and 1,874,931 for March, 1938.

Export sales for March amounted to 116,206 units, compared with 106,439 for February and 78,823 for March, 1938. Production of pneumatic casings was 5,137,030 units, an increase of 18.3 per cent over the February figure of 4,343,513 and 91.7 per cent over the March, 1938, production of 2,679,735.

Pneumatic casings in the hands of manufacturers March 31 were 10,108,584 units. This represents an increase over the February 28 figure of 9,572,553 units, but is under the 10,520,813 units on hand March 31, 1938.

bide. Recent negotiations between the Sumitomo Chemical Co. and E. I. du Pont de Nemours & Co. for acquisition of the latter's Neoprene patents have broken down, and Japan is now trying to obtain a manufacturing license for Germany's Buna rubber.

Automobile Bodies From Lauan

The Nisson Rubber Co., sister enterprise of the Nisson Automobile Co., is manufacturing automobile bodies from lauan in a plant especially built for

1938 Output (Estimate for Japan only)	Increase, in per cent, by April, 1942
6,000,000 tons	60
.....	100
12,000 tons	100
87,000 tons	80 plus
.....	2,900
.....	100 plus
30,000	500

this purpose.

Lauan is a tropical timber much in demand for veneer and plywood. The Nisson Rubber Co. has acquired extensive felling concessions in the Netherlands Indies, where it is also operating large rubber plantations.

Chek-Chart Blue Book

Chek-Chart Corp., 624 S. Michigan Ave., Chicago, has announced the publication of the 1939 edition of its Accessory Blue Book. The book, containing specifications of replacement accessories for all cars in general use, may be obtained from the company at a price of \$3.00.

GM Dividend

A quarterly dividend of 75 cents per share was declared on the common stock of the General Motors Corp., payable June 12 to stockholders of record May 11. The regular quarterly dividend of \$1.25 per share was declared on the \$5 preferred stock of the corporation, payable Aug. 1 to stockholders of record July 10.

English Group Seeks Solution of Car Trade-in Allowance Problem

Motor Trade Association Commission Recommends Changes in Price System

In January, 1938, the executive committee of the English Motor Trade Association (a body representing both manufacturer and dealer interests) appointed a commission to consider and report as to the operation of the National Used Car Price Book. The report was presented to the council of the M.T.A. in June last year, but has only just been released for publication; it makes a number of recommendations from a wide variety of viewpoints.

It may be recalled that the National Used Car Price Book represents a system of price maintenance in respect of used cars, and indirectly of new cars. It indicates the maximum allowance value of used cars of all makes and models on the English market current for five years past, and is published each month with revisions based upon returns received from hundreds of dealers in all parts of England and Wales as to the prices obtained in the sale of used cars.

Any dealer proved to have taken a used car as part-payment for a new one at an allowance figure exceeding that attached to it in the book current at the time is liable to be "black-listed" by the M.T.A., with the same effect as if he had sold the new car for cash at less than the manufacturer's list price. A black-listed dealer is prevented from obtaining supplies of all kinds, including new cars, from manufacturer members of the M.T.A., which obviously may mean ruin.

In making their recommendations the commission admit that it can never be expected that the book allowance figures will at all times be correct under all conditions, but can do no more than reflect reasonably accurate estimates upon which dealers may rely under normal conditions. The commission held 21 sittings, and beyond written evidence examined witnesses representing all sections of the industry; it also had before it an analysis of completed questionnaires received from all sections. Only two of almost innumerable witnesses disagreed with the view that the system in general had been of great benefit to the trade, though having scope for improvement.

The chief recommendations may be summarised as follows:

A flexible allowance system should be adopted to permit greater scope for salesmanship. The book allowances should therefore be deemed the "basic value," which the dealer should be allowed to increase if necessary to effect a sale by a "plus allowance," consisting of £1 for each complete £10 of the list price of the new car concerned in the deal.

Book basic values should be based upon the averaged returns from dealers, as hitherto, supplemented by the averaged prices quoted by dealers in used car advertisements. The use of the latter should counteract the time-lag attached to the use of dealers' returns only. To arrive at the book prices for publication, these averaged figures should then be subject to reductions of 15 per cent of the original list price of cars up to four years old and 10 per cent in the case of cars five to six years old. In March, April, May and June each year (the peak period of used car sales), these reductions should be 12½ (Turn to page 638, please)

CALENDAR

Conventions and Meetings

- Chamber of Commerce of the United States, Annual Meeting, Washington, D. C. May 2-4
- American Roadbuilders Association, Annual Meeting, San Francisco, May 7-10
- The National Battery Manufacturers Association, Spring Convention, The Greenbrier Hotel, White Sulphur Springs, West Virginia May 11-12
- American Foundrymen's Association, Forty-third Annual Convention, Cincinnati May 15-18
- SAE World Automotive Engineering Congress May 22-June 8
- National Metal Trades Association, Annual Meeting, Chicago.... May 24-25
- American Iron & Steel Institute, Annual Meeting, New York City.. May 25
- American Society for Testing Materials, Annual Meeting, Atlantic City June 26-30
- Automotive Engine Rebuilders Association, Seventeenth Annual Convention, Baltimore, Md. July 5-7
- National Petroleum Association, Annual Meeting, Atlantic City, Sept. 14-15
- American Welding Society, Annual Meeting, Chicago Oct. 22-27

- American Trucking Association, Annual Meeting, Chicago Oct. 23-24
- American Petroleum Institute, Annual Meeting, Chicago Nov. 13-17
- National Independent Traffic League, Annual Meeting, Chicago.... Nov. 23-24

Shows at Home and Abroad

- Great Britain, London, Automobile Show Oct. 12-21
- National Automobile Show, New York, Oct. 15-21
- Italy, Milan, Automobile Salon, Oct. 25 to Nov. 11
- International Automobile, Motorcycle and Motor Boat Show, Budapest, Oct. 27 to Nov. 6
- Great Britain, London, Commercial Automobile Transportation Show, Nov. 2-11
- National Truck Show, Chicago.... Nov. 8-16
- Great Britain, Glasgow, Scotch Automobile Show Nov. 10-18

"Perfect Wing" For Aircraft

Development of the "perfect airplane wing" has been announced by David R. Davis, veteran aeronautical designer and former partner of Donal Douglas of the Douglas Aircraft Corp., Los Angeles. From an aerodynamic standpoint, Davis said that the wing he developed is 100 per cent effective and will increase the speed of planes at least 20 per cent.

The new type of wing was worked out by Davis in an involved mathematical formula which when translated geometrically gave the proportions of the "perfect wing," he said. The designer reported he submitted his formula to the Guggenheim aeronautical laboratory at California Institute of Technology where a sample wing was constructed and then tested in wind tunnels. He reported that the wing solved the problem of giving a plane the maximum possible lift with the minimum possible drag.

He said he and an associate, Walter Brookins, a veteran airman, spent 10 years studying the rotor motion of air around a plane's wing before working out the formula for the perfect curve of a wing section.

The designer reported that a major aircraft company, whose name he did not disclose, has contracted with him for use of his formula on a royalty basis.

New Car Registrations and Estimated Dollar Volume by Retail Price Classes*

	FEBRUARY, 1939		FIRST TWO MONTHS, 1939			
	Units	Dollar Volume	Units	Per Cent of Total	Dollar Volume	Per Cent of Total
Chevrolet, Ford and Plymouth...	93,273	\$68,200,000	207,245	56.32	\$151,600,000	50.03
Others under \$1000.....	56,073	41,800,000	125,093	33.99	105,500,000	34.82
\$1,001 to \$1,500.....	12,740	14,800,000	30,551	8.30	36,000,000	11.88
\$1,501 to \$2,000.....	1,898	2,800,000	2,927	.80	4,600,000	1.52
\$2,001 to \$3,000.....	850	1,900,000	2,015	.55	4,600,000	1.52
\$3,001 and over.....	64	300,000	152	.04	700,000	.23
Total.....	164,808	\$129,800,000	367,993	100.00	\$303,000,000	100.00
Miscellaneous.....	134		171			
Total.....	164,942		368,154			

* All calculations are based on delivered at factory price of five-passenger, four-door sedan, in conjunction with actual new car registrations of each model. The total dollar volumes are then consolidated by price classes.

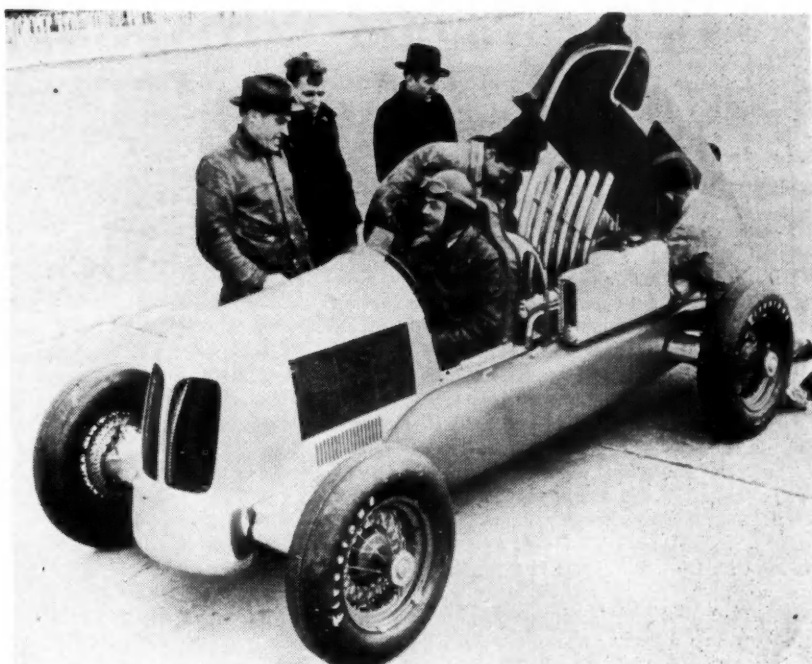
Pour le Roi

Selected craftsmen in Canadian automobile factories are completing specially built Royal automobiles for use of the King and Queen and their immediate entourage during their tour of Canada. With particularly luxurious fittings, design of the four cars is adapted to the unusual requirements of their exalted occupants-to-be and the purposes for which the automobiles will be used during their progress throughout the Dominion of Canada. All are large convertible sedans with fabric tops which may be lowered during processions through Canadian cities on the royal itinerary. Specially large rear windows will permit Their Majesties to be seen in case weather prevents lowering of the top.

The cars are being completed in the Oshawa, Ont., plant of General Motors of Canada, Ltd., the Windsor, Ont., factories of the Ford Motor Co. of Canada, Ltd., and the Chrysler Corp. of Canada, Ltd. The special bodies and fittings are being built up on chassis and motors ordinarily used in production of McLaughlin-Buick, Lincoln and Chrysler Royal automobiles. Features of the motor cars include tonneau folding seats facing the rear, as etiquette forbids turning one's back to Their Majesties. Hand painted royal crests adorn the rear doors, and illuminated royal insignia surmount the center posts of the windshields. Rear compartments will be thickly carpeted and will be fitted with lap robes and hassocks.

Chrysler Adding To Pacific Plant

Addition to plant property which will add 17 acres of land space bringing the total to 44 acres for the Los Angeles plant of Chrysler Motors of California have been announced by Paul W. Gaebelin, vice-president of the Pacific



International

For the Five-Century

George Bailey is shown at the wheel of the car he will drive in the annual 500-mile Memorial Day classic at Indianapolis. The rear-engined car is one of three of the same type entered by Harry Miller. Miller's cars, unable to enter last year's race because they were not completed in time to iron out the "bugs" before the race, have already been well broken in for this year's speed festival.

Coast unit. Extensions of the plant building contemplate an additional 76,000 sq. ft.

In addition to plant expansion, the projected program is for an extensive modernization and improvement plan of major proportions. These improvements will include the installation of new rust proofing and finishing department, a new sheet metal finishing department, new material handling equipment and rearrangement and modernization of the passenger car and truck assembly lines. Two large plant additions are contemplated, with new concrete receiving and shipping docks, half a mile of concrete road and 920 ft. of railroad tracks.

40 YEARS AGO

Whether a dashboard is necessary on a motor vehicle has been a mooted question. Many contend that when the horse is removed the dashboard should disappear with him, inasmuch as its chief use is to shield the driver from the mud and water thrown back from the horse's hoofs.

While it is true that there is in a motor vehicle no further need of protection from the horse and his mud throwing hoofs, it seems to us that the dashboard has other important uses. It is a shield from the wind, which in cold and stormy weather cannot be sufficiently tempered by the ordinary lap robe, and, in case of accident it may serve as a fender to ward off shocks and a support to prevent the occupants from being thrown forward onto the ground. Let us think twice before we discard the dashboard entirely.

* * *

Sheet metal is being quite extensively used for motor vehicle bodies abroad, and some of our own constructors are experimenting with it. In some kinds of vehicles the objection is raised that the sheet metal makes too much noise on rough roads. This is undoubtedly true, but is it not possible to employ some kind of packing in the joints which shall go far to remedy this?

From *The Horseless Age*, May 1899.

Estimated Dealer Stocks of New Passenger Cars

1938	January	February	March	April	May	June
Production—U. S. Domestic Market†.....	130,273	119,896	153,316	160,028	140,239	123,333
Retail Sales—U. S.†.....	126,442	120,348	188,325	193,392	187,306	155,611
Change in Inventory.....	+3,831	-452	-35,009	-33,364	-47,067	-32,478
Inventory, first of month.....	408,157	411,988	411,536	376,527	343,163	296,096
1938 (continued)	July	August	September	October	November	December
Production—U. S. Domestic Market†.....	96,975	53,955	60,177	171,371	295,366	305,900
Retail Sales—U. S.†.....	153,426	123,711	90,629	134,984	241,009	241,623
Change in Inventory.....	-56,451	-69,756	-30,452	+36,387	+54,357	+64,277
Inventory, first of month.....	263,618	207,167	137,411	106,959	143,346	197,703
1939	January	February	March	April	May	June
Production—U. S. Domestic Market†.....	263,225	223,745	279,148	.....	.....	.....
Retail Sales—U. S.†.....	180,651	165,841	276,292	.....	.....	.....
Change in Inventory.....	+82,574	+57,904	+2,856	.....	.....	.....
Inventory, first of month.....	261,980	344,554	402,458	405,314	.....	.....

†—U. S. Census Bureau.

‡—Automobile Manufacturers Association.

May Delay Wagner Bill Action Until 1940 for "Drastic" Changes

Proponents Feel Stay Would Strengthen Pro-revision Feeling

While prospects for revision of the Wagner Act at this session of Congress continued to hinge on the length of the current session, there were signs that new strategy was being urged by some proponents of revision who were passing the word along that by waiting until 1940 a more drastic change in the law may result from accumulated resentment against NLRB tactics and Administration failure to accept revision demands.

Failing this development, these strategists look to an injection of the AFL-CIO controversy into the 1940 elections, with a possible realignment of the AFL with the Republican Party and the CIO with the New Deal machine, to force the Wagner Act issue to a showdown. By opposing the AFL request, it is reasoned, the Administration is driving the Federation into closer alinement with industry with the result that the combined forces may appeal to the Republican convention next year where the AFL requests can be expected to be received with open arms.

Obviously, CIO Generalissimo Lewis hopes to capitalize on any development which brings the AFL into agreement with business just as he did recently when he charged in a letter to the Senate Education and Labor Committee that in framing the Federation amendments to the Wagner Act, the AFL received "the aid, advice and counsel of the National Association of Manufacturers and several of the most reactionary and anti-labor corporations of the country."

President William Green, of the AFL, smarting under the accusations, denied categorically that the manufacturers had been consulted before drafting the AFL amendments.

"The purpose of the Lewis letter is patent and obvious," the AFL chieftain told the committee. "It was prepared and submitted for propaganda purposes. It is filled with trickery and deception. It has nothing to do with the merits of the amendments to the National Labor Relations Act sponsored by the American Federation of Labor."

Senator Thomas, chairman of the committee, who postponed hearings in the Wagner Act because of fears that they might interfere with AFL-CIO peace negotiations, denied newspaper reports that his committee had been "stalling," insisting that it was his intention to proceed as expeditiously as possible. Mr. Green asserted that the Wagner Act dispute need not necessarily be "a basis for bitterness," but conceded that NLRB activities had aggravated the split in the ranks of organized labor.

The current hearings have given both labor groups a chance to air their views in public and an opportunity to vigorously assail each other in a manner not possible when their representatives were conferring at "peace" negotiations. Some observers believe that even though labor's differences could otherwise be settled the current sessions over Wagner Act revision so accentuate the difficulties that peace prospects before the 1940 elections would be regarded as slim.

"The CIO offers the best evidence, through vicious propaganda and misrepresentation and prejudicial suggestions of their determination and desire to hold fast and maintain all the benefits and advantages which have accrued to them through the maladministration of the National Labor Relations Act by a prejudicial board," Green charged at the hearings. "They are fighting desperately against giving up the advantages they hold and which have been accorded to them by a board which evidently has absorbed and accepted their peculiar brand of trade union and economic philosophy."

The AFL president proposed during his two-day appearance, that the present three-man labor board be displaced with a five-man board and charged that AFL membership had increased in the past four years in spite of and not because of NLRB activities. He emphasized especially the need for approving provisions contained in the

Walsh-AFL emendments designed to relax present prohibitions against employer "interference," and cited a number of cases, including the Consolidated Edison case, in substantiation of his charge that the board "jumps on any pretext for the purpose of upsetting our contracts."

Car Tax Bill 9 P.C., Says Women's Group

An estimated \$46,000,000 was paid by new car buyers in direct and hidden taxes on their purchases during the first quarter this year, according to a survey by the National Consumers Tax Commission.

The commission lists 206 taxes involved in the manufacture and distribution of an automobile that "the consumer pays as part of the retail purchase price." The report cites an Automobile Manufacturers Association report of 622,785 cars sold in the first quarter.

The commission, described as a national women's organization seeking, through local study groups in 4,200 communities, to "arouse tax consciousness among women and to oppose consumer-penalizing taxes," declared:

"During the first three months this year, new car sales totalled an estimated \$500,000,000. Of that amount 9.4 per cent went for taxes, most of which were not visible to the purchaser.

"This hidden tax burden is the pyramid of levies against metal, rubber, leather and glass producers and manufacturers, against cotton and wool growers, cloth manufacturers, railroads, automobile manufacturers and dealers. Unable to absorb their tax load, the businesses must pass on at least part of their taxes to the ultimate buyer."

AUTOMOTIVE INDUSTRIES

Summary of Automotive Production Activity

BUSES Manufacturing operations up slightly. One large producer states it is now over the 50 per cent mark, having increased output gradually for the past month. A few important inquiries reported, but sales have not risen to recent expectations.

TRUCKS Several producers reporting increases in schedules. Sales reports vary from "best month this year" to "well down as compared to last month."

TRACTORS Virtually no change in activity since previous summary. Producers not overly optimistic concerning business for remainder of this year.

AUTOMOBILES Output expected to continue at healthy pace throughout this month, although at a gradually declining rate. Preliminary estimates set the May total over 300,000 cars and trucks.

MARINE ENGINES Production holding at good pace. Sales also reported holding up well with distributors expecting an excellent season.

AIRCRAFT ENGINES High speed production likely to continue well into 1940. Backlogs of powerplants and parts continue to grow despite heavy schedules.

This summary is based on confidential information of current actual production rates from leading producers in each field covered. Staff members in Detroit, Chicago, New York and Philadelphia collect the basic information, in all cases from official factory sources.

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Packard Sets New Prices for '39 Cars

Packard Motor Car Co. announced price reductions ranging from \$100 to \$300 in the Six, 120 and Super Eight groups of 1939 models. The reductions, according to M. M. Gilman, newly elected president, climaxed a four year expansion program. "This announcement," said Mr. Gilman, "stresses for the benefit of our field organization the permanence of Packard's new lower-priced policy. This is not a temporary reduction but is the beginning of a new permanent price policy, the fulfillment of a plan that has been four years in the making."

The new prices for the Packard line are as follows:

	Old Prices*	New Price Effective May 1*	Reduction
Packard Six			
Touring Sedan, 4-door	\$1095	\$ 995	\$ 100
Touring Sedan, 2-door	1065	964	101
Club Coupe	1045	944	101
Convertible Coupe	1195	1092	103
Business Coupe	1600	888	112
Station Wagon		1404	...
Packard One-Twenty (127 in. wb.)			
Touring Sedan, 4-door	1295	1196	99
Touring Sedan, 2-door	1265	1166	99
Club Coupe	1245	1145	100
Convertible Coupe	1390	1288	102
Convertible Sedan	1700	1600	100
Business Coupe	1200	1099	101
Station Wagon		1636	...
148 in. wb.			
Touring Sedan, 7-passenger	1805	1702	103
Touring Limousine	1955	1856	99
Packard Super Eight (127 in. wb.)			
Touring Sedan, 4-door	2035	1732	303
Club Coupe	1955	1650	305
Convertible Coupe	2180	1875	305
Convertible Sedan	2435	2130	305
148 in. wb.			
Touring Sedan, 7-passenger	2460	2156	304
Touring Limousine	2600	2294	306

Packard Twelve prices remain unchanged.

* Includes Federal Taxes, but no state or local taxes or transportation charges from factory.

PUBLICATIONS

The 24th catalog edition of the Chicago Eye Shield Co. comprises 48 pages describing the company's specialized equipment for head and eye protection.*

The Parker-Kalon Corp. announces the publication of a **socket screw drafting room chart**. The chart condenses in a form suitable for ready reference, a large amount of data essential to users of socket screws.*

A circular by the Blanchard Machine Co. describes the new **adjustable gap demagnetizer** which the company has just placed on the market.*

A 48-page booklet covering applications, description and technical data on its

Riverside phosphor bronze has been published by the Riverside Metal Co.*

A bulletin by Wheelco Instruments Co. describes its **recording thermometer**, series 150.*

The Self Vulcanizing Rubber Co., Inc., has released a booklet on its **self cold curing SELFVULC plastic and liquid rubber compounds** said to assure positive protection against corrosion, abrasion and chemical action.*

Bulletin 394 by the National Instrument Co. describes its new model 161-L **Timer with indicating lamp**, an electrically operated counter to automatically register the total number of hours that any electrical device or motor-driven machine has been in operation.*

A method of lubricating saturated and superheated steam engines to produce oil-free exhausts and operating economies is described in bulletin No. 150 by the Acheson Colloids Corp.*

Corrosion Engineering Co., Philadelphia, Pa., has published a leaflet "**Cromone**", a rust and corrosion inhibitor for automotive cooling systems.*

"Products of Haynes Stellite Co.—Tables of Physical, Mechanical and Chemical Properties", is a new booklet brought out by **Haynes Stellite Co.**, Unit of Union Carbide and Carbon Corp.*

* Obtainable from editorial department, AUTOMOTIVE INDUSTRIES. Address Chestnut and 56th Sts., Philadelphia.

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Kiln car wheels



Glass bottle molds



Die casting molds



Conveyor chains

..beats heat!

"Dag" colloidal graphite retains its lubricating properties in the presence of extremely high temperatures — it reduces wear, carbon and flake-off. Ideal lubricants for equipment which operates at temperatures above the burning point of petroleum oil are prepared by dispersing "dag" in suitable fluids. These should be volatile at the temperatures in question. With the quick evaporation of the carrier fluid, a dry lubricating film of pure "dag" is left which physically combines with the bearing surface.

"Dag" colloidal graphite is chemically inert, non-gumming, odorless and non-oxidizing—it is economical and offers an ideal solution to high temperature lubrication problems in glass making and ceramic machines, for conveyors and baking ovens, for projectors, die casting and permanent mold equipment, etc.

A note on your letterhead will bring you an inspection sample and Bulletin 130 which tells how to use "dag" for high temperature lubrication. . . You or your oil supplier can easily add "dag" to your present lube or to specially selected petroleum fluids.

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Ford "6%" Case in Final Stages; Action on GM Still Pending

*Ourselves and Government—A Check List
Of Federal Action Corrected to April 27*

FEDERAL TRADE COMMISSION

SIX PER CENT CASE. Final arguments on the Ford case started in Washington on May 4. A similar case, involving the FTC complaint of false and misleading representations as to interest charged automobile purchasers

under deferred payment plans, is pending against General Motors.

VS. UNITED STATES RUBBER CO. and its subsidiary, U. S. Tire Dealers Corp. (No new developments—see May 1 issue).

FAIR TRADE PRACTICE RULES. (No new developments—see May 1 issue).

F.O.B. PRICE CASE. (No new developments—see May 1 issue).

GENERAL MOTORS EXCLUSIVE DEALER CASE. (No new developments—see May 1 issue).

DEPARTMENT OF LABOR

STEEL WAGE CASE. (No new developments—see May 1 issue).

Britain Studies Trade For War-Time Services

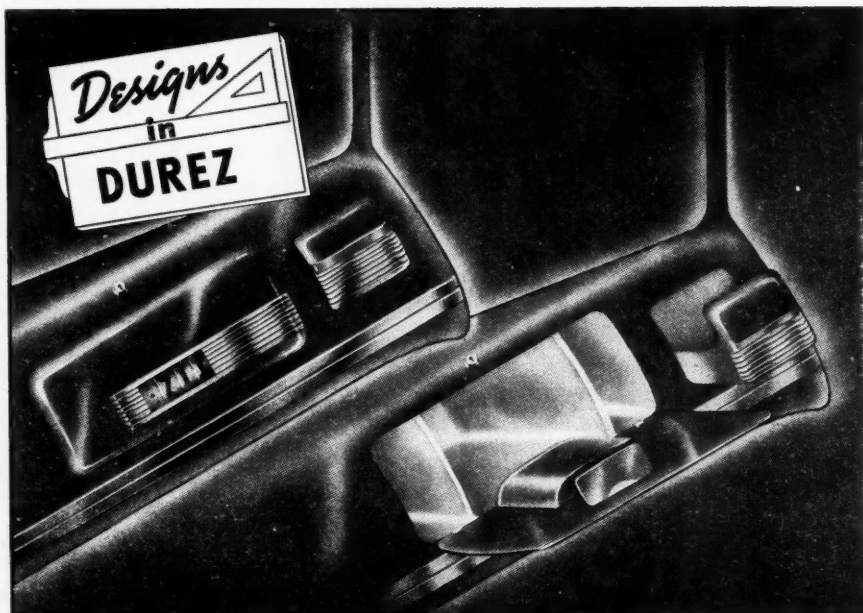
Under the chairmanship of Lord Austin a National Service Committee of the Retail Motor Industry was set up in England last December, representing the various manufacturers' and dealers' associations, with the object of collecting information for the Government that would enable the latter to make the best use of the staff, equipment and stock of dealers, service stations and retail motor traders in general. The committee has now put forward a census covering a wide variety of points and a considered plan whereby the entire resources of the retail motor trade could be utilized immediately and efficiently in the event of war.

An important aspect of the scheme is that it would tend to reduce the risk of the services of the industry's skilled men being lost through haphazard recruiting for the armed forces, while among other objectives are the promotion of the maximum degree of efficiency and economy in maintaining and servicing the nation's road transport system and the prevention of waste of public funds resulting from the duplication of effort by Government departments and local authorities.

After consultation with the various Government departments concerned the committee issued a questionnaire to 15,672 firms and individuals comprising the membership of retail trade associations. About 66 per cent were returned completed by the date specified and were immediately analyzed. They showed, among many other things, that 93,000 men are employed by this 66 per cent of the trade. About 5,000 already are Army reservists or members of the Territorial Army; the remainder has been subdivided and analyzed under trade classifications and by areas.

The survey showed also the geographical distribution of specified types of cars, trucks, etc., new and used, held in stock by dealers, and the quantities and varieties of spare parts. It showed, too, the industry's vehicle storage capacity at 100 sq. ft. per vehicle in repair shops, garages and showrooms and the facilities of firms, including body-builders, who are now or could be employed on munition work in many specified spheres.

In putting forward their National Service scheme, the committee recommended that its function should be mainly to provide personnel and mate-



Idea For a MOLDED DASHBOARD COMPARTMENT

It doesn't take a salesmanager to know that it's the sum total of the little distinctions that adds up to sales. Such an eye-pleasing touch is this spirited dashboard compartment designed in molded Durez by Joseph B. Federico.

The compartment, pigeonholed to keep gloves, roadmaps and what-have-you unscrambled is designed for molding in one piece. So is the door, which contains a jump dial-clock housing and mirror—and the ash tray, which slides on noiseless Durez tracks. Trim chromium plated fittings complete the effective ensemble.

All very simple...but it shows that you don't have to look hard to find many places where Durez plastics can do a real job for your new models! Let us work with you in developing new plastic applications. Write General Plastics, Inc., 95 Walck Road, North Tonawanda, N. Y.

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- Coil tops
- Spark plug shields
- Window trim
- Dashboards
- Shift lever finials
- Ash trays
- Cigar lighters
- Radio grilles
- Heater housings

DUREZ PLASTICS THAT FIT THE JOB

rial for servicing both civil and military transport vehicles. It pointed out that the engineering versatility of the experienced garage mechanic is of great National importance; a good garage mechanic, it is said, is well qualified, for example, to undertake work as a blacksmith, welder, engine tester, fitter, turner, drill, borer, grinder, tire fitter, etc. It was urged that in the servicing and repair of civil and military vehicles operating in the United Kingdom there is no necessity whatever for the expenditure of public funds in duplicating the facilities that could be provided by the retail motor trade.

Directions in which the retail motor industry's existing organizations should be utilized were specified as including the following: The reception and distribution of personnel; recruitment for the establishment of training centers for combined technical and military service; control of the work at appointed repair centers; the requisition and valuation of additional vehicles; the provision of vehicles for assisting in the evacuation of the civilian population and the staffing and equipping of first-aid fire-fighting equipment. Additionally, suggestions were made as to how the organization could be utilized in connection with military and civilian vehicle convoys, tire distribution, air defense, the Territorial Army field force, base workshops, food production and distribution and metal salvage.

The questionnaire provided a census relating to the following, among many other matters: Office accommodation and equipment, female staff qualified as drivers, new and used cars and trucks in stock classified by make, power, body style and capacity, stocks of spare parts, tires, motor cycles, road and farm tractors, repair and service equipment, gasoline and oil pumps, and storage tanks with their capacities.

May Subpoena Trade Asso. Quiz Holdouts

Some 250 recalcitrant trade associations, which have failed after the third request to send in answers to questionnaires mailed out last September by Commerce Department representatives of the Temporary National Economic (anti-monopoly) Committee, are being threatened with subpoenas if the requested information is not forthcoming.

Assistant Secretary of Commerce Patterson said in a letter to the various associations that his Department "had hoped that this study could be conducted entirely on a voluntary basis, and therefore will sincerely regret it if necessity compels us to proceed on a somewhat different basis."

The Department was known several months ago to have taken under advisement the question of issuing subpoenas but is understood to have soft-pedaled the idea temporarily when the Administration's "business appeasement" program was inaugurated. Out of 2300 associations solicited, most of them re-

sponded promptly but the 250 "hold-outs" whose identities have not been disclosed, either ignored or declined the request.

Since that time, five out of the 250 trade associations have, upon advice of counsel, declined to make the necessary returns. These facts prompted Mr. Patterson to point out in his letter that, unless all returns are submitted the results of the survey will be "open to question," and that the names of the associations will no longer be kept confidential.

The questionnaire sought information on management and affiliation; composition of membership; scope of association activities; personnel, income

and balance sheet data covering dues and assessments; and contributions to the industry claimed. It also asked for copies of constitutions and by-laws.

Rowland Takes Over Two Eaton Branches

William & Harvey Rowland, Inc., Philadelphia, manufacturers of leaf springs, has purchased the Philadelphia and Atlanta branches of Eaton Products, Inc. The Atlanta and Philadelphia branches will continue to service the trade on springs, Truckstell axles and other equipment, as well as chains.

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SERVICE PROVED INDUSTRIAL OILS

Trade-In

(Continued from page 632)

per cent and 7½ per cent respectively. The percentage reductions represent a margin for sales expenses connected with the used car taken over; reconditioning costs before resale are "left to the acumen of the individual dealers."

The relinquishment of manufacturer control of the book is considered essential for reasons that are set forth at length in the report, one of which is that book price control by the individual manufacturer gives rise to a

general upward tendency of prices to the detriment of dealer interest as a whole. The present system by which manufacturer influence may be exerted upon book prices is believed to have contributed to the distrust with which the book has been regarded by many dealers.

Returns from dealers should specify not the age of the particular car—the year of manufacture—but the factor of length of registration. Mileage would be preferable, it is admitted, but is considered impracticable. Length of registration, it is held, would overcome the difficulty of assessing values due to the growing use by manufacturers of the

series system of identifying various models. The basis of length of registration would also enable distinction to be shown between, say, a 1938 model first used in September, 1937, and one registered originally in June, 1938.

Even when a new car has had its price decontrolled, the book allowance value of a used car offered in part exchange should in no circumstances be exceeded.

No book basic value should be published until it shall have fallen to £200 or less. This means that no attempt to control used car values of more than £200 is considered desirable. In the original scheme (adopted in 1935) the book covered cars of values up to £325.

If a dealer should be asked to quote an allowance price for any car not specified in the book, he should be required to apply to the M.T.A. for its basic value, the latter to be determined by a valuation committee, which also should fix basic values for all cars not covered by at least 10 dealer returns.

Forward quotations and annual replacement contracts should also be subject to value fixation by the valuation committee.

In its outline of evidence and reasonings, the commission comments upon a large number of subjects concerned directly or indirectly with their terms of reference. One of these is the attitude of dealers towards the used car problem. There is evidence, it is said, that many dealers are not active in seizing such advantages as are possible in this admittedly difficult market. There is a tendency to regard the new car as the sole source of profit and the resulting used car sales as capable at the best of providing an "even break."

Another comment is that, according to evidence, the used car market in the higher horsepower classes has become glutted and that the prospects of profitable trading in these is steadily diminishing. Many witnesses regard used cars of more than 14 hp. as practically unsaleable retail, except by the specialist dealer.

On the whole the commission's recommendations have been favorably received. The "plus allowance" proposal is subject to most criticism. In regard to this "Motor Trader" (London), in publishing the report said: "That the flexible allowance system, introducing a 'plus allowance,' graded according to the list price of the new car that is being sold, will arouse criticism we fully anticipate. The dyed-in-the-wool price protectionists are already holding up their hands in horror at what they look upon as legalized price-cutting. They prefer, of course, to see manufacturers' list prices maintained, rather than dealers' profits protected. The variable allowance system is a practical, business-like measure, as distinct from a theoretical principle; it is designed to meet the needs of the moment. If the trade rejects it then it might as well reject the whole of the report, which really stands or falls by that proposal."



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